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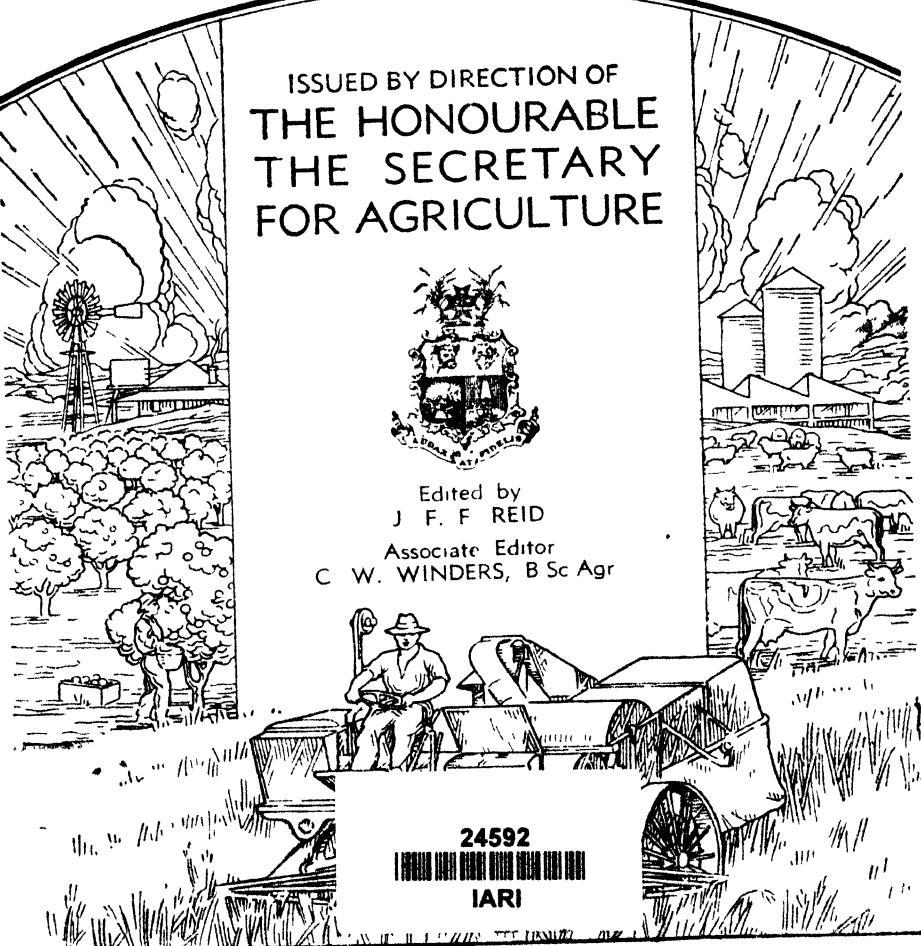
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GENERAL INDEX.

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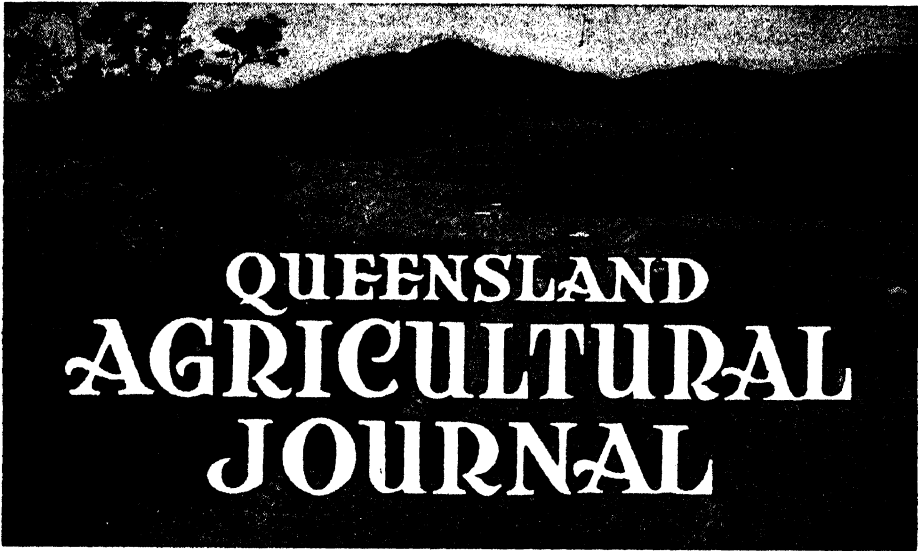
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Part 1

Event and Comment.

Food Needs of 1944.

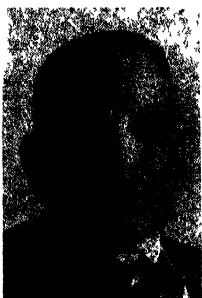
IN a special article in this issue, Mr. T. L. Williams, Minister for Agriculture and Stock, stresses the importance of increased food production during 1944, and pays tribute to the farmers and graziers of Queensland who have already contributed substantially to the food needs of the Commonwealth and Allied Nations, in spite of shortage of labour and of other essential requirements of full-scale primary production. There is no doubt that producers will continue to respond readily and wholeheartedly to the call for a progressively expanding output as far as means, facilities, and seasonal circumstances will allow them. Food production has become a No. 1 priority in Australia's war effort. Food will be needed for our fighting forces until the fighting finishes; food is needed for the people of Britain who have held the fort for more than four years of war; and food is needed for those hungry people who are being set free as our armies march along the road to victory.

The food producers of Queensland know all this and they know, too, that in food production there can be no to-morrow or the day after. And they also know that in crop production there are many hazards, and they look to the powers that be to reduce those risks as far as practicable by ensuring supplies for the maintenance of equipment and essential transport and the availability of materials without which a full measure of production may be unattainable. They may count, however, on the co-operation of the Queensland Government, as stated by Mr. Williams, in every effort to reach the crop objectives set for 1944.

THE MINISTER'S NEW YEAR MESSAGE



AS we stand upon the threshold of the New Year, I wish to pay a sincere tribute to the farmers and graziers of Queensland for the friendly co-operation and assistance they have freely given to me as Minister and to the officers of the Department of Agriculture and Stock.



Although the stress and strain of circumstance have been heavy during the past year, our primary producers have responded nobly to national needs. They have not only maintained the production of essential foods but, in some cases, actually increased it.

Apart from the service and the sacrifice of our fighting forces, which we acknowledge with pride and with reverence, no contribution to a country at war can have greater value than that given by the farming community.

Confidence and courage are keynotes of Australian character. In these and in all those other things which build a nation and make it secure, the food producers of Queensland have worthily carried on the traditions of their pioneering forebears.

Throughout the year now beginning we shall need active and intelligent co-operation from all in our allotted tasks. These call for vigorous and sustained effort as our contribution to the coming victory and to the building of an Australia worthy of the men and women who have offered all in her defence.

To the primary producers of Queensland, I wish health and happiness in the year now opening before us, and a happy reunion at home with those now absent.

L. Williams.

Secretary for Agriculture and Stock.

1st January, 1944.

The Drive for Increased Production.

T. L. WILLIAMS.

In this article the Hon. T. L. Williams, M.L.A., Minister for Agriculture and Stock, expresses appreciation of the achievements of the primary producers of Queensland in the past year and stresses strongly the need for greater food production in relation to national needs and in fulfilment of Commonwealth commitments during 1944.

BECAUSE of abnormal conditions arising out of the war, the agricultural and stockraising industries of Queensland, in common with the industries of other States, are faced with many complex problems.

It is only to be expected after more than four years of war, during which the resources of the Commonwealth had to be mobilized, that the effects on production, marketing, and distribution have been most disturbing. That was substantially the situation when I assumed the responsible office of Minister for Agriculture and Stock just twelve months ago. Since then, problems of manpower, supply, transport, and other matters affecting production and the welfare of the land industries have become progressively more acute. Practical solutions have been found for some of these problems; others have so far proved more difficult because of constantly changing conditions.

Here I would like to record my appreciation of the friendly and valuable co-operation which I have received from producers and their organizations representing every rural enterprise. No other section of the civil population has given greater service to the nation than the men on the land and their wives and children. But for their arduous work in all sorts of weather, sometimes before sunrise and long after dark, it would have been impossible to maintain food production at its present level.

I also desire to pay a well-deserved tribute to the officers of every branch of the Department which I have been called upon to administer. Through enlistments, transfers to Federal Departments, and call-ups for other services, the staff has been considerably depleted, but those remaining have undertaken the consequent additional work in an admirable spirit, discharging their onerous duties with determination and efficiency.

The heavy responsibility of ensuring adequate supplies of essential foods on a continually expanding scale has been necessarily my main preoccupation and that of departmental officers. The fact now is that, notwithstanding an extraordinary increase in the number of consumers, the general supply position in Queensland compares favourably with that in other States.

Food Requirements for 1944.

In the present year, greater demands than ever before in our history will be made on the food resources of Australia. That is the position we have to face.

Food production objectives have been set for 1944. To attain these targets, it will be necessary to provide for substantially increased production of practically all essential foodstuffs, including meat, wheat, sugar, butter, cheese, eggs, and potatoes. There are, admittedly, many difficulties in the way of farmers who are called on to extend their culti-

acres or to increase their output. Still, it is not so much the number of acres under crop that counts; it is the yield from those acres that really matters. An increased yield of every kind of farm-grown food is, after all, our main objective. Another half gallon a week from every milking cow would, for instance, mean the attainment of our dairy production goal. And that idea could be applied to every other form of food production—one more acre properly cultivated, one more ton added to the weight of a crop yield, one more prime beast turned off our pastures, one more pig fattened to factory requirements, one more dozen eggs a day from every poultry farm and we would be right on our food production targets. And even if those targets are attained, the higher yields will be certainly absorbed by progressively increasing requirements of our agricultural strategy. For this and other cogent reasons, every Queensland food producer is urged to make his individual production figure for 1944 a record.

Food a Munition of War.

Food may be regarded as a munition of war; and especially in the closing stages of the war food supply will become of increasing importance. The greater the fighting force in the South-West Pacific, the shorter will be the war with Japan. So, obviously, Australia's capacity for essential food production will be a big factor in determining the effective fighting strength of the Allied Forces.

Then, again, food is required for the people of Britain who have suffered more than any other people, except those in enemy occupied countries. And food will not only win this war, but will be one of the most important factors in planning for a just and lasting peace.

Normally, Australia's food production is high, but the demands on it now are heavier than ever. For example, Britain's present meat requirements are greater than our pre-war shipments to the British markets. Before the war, we were bigger exporters of food than is commonly known. Australia was the third greatest wheat exporter, the second greatest meat exporter, the third greatest butter exporter, almost the world's greatest dried fruit exporter, the second greatest canned food exporter, Britain's third largest supplier of barley, and Britain's largest individual supplier of eggs. For most of these and some other commodities, we looked to Britain as our principal and most profitable market. Notwithstanding a change in fiscal policy in 1932, Britain continued to give some measure of preference for Australian products. And just before the war Britain arranged to take all Australian surplus food products, and this enabled us to plan our production with the confidence that an assured market gives. Our obligation to Britain, apart altogether from the natural obligation of kinship and participation in a common cause which we proudly acknowledge, is, therefore, very plain.

Yet, we cannot meet the increasing demands on our food resources unless we attain a record level of production in 1944. As far as Queensland producers are concerned, in the campaign for greater food production they may count on the continued co-operation of the Department of Agriculture and Stock, and on the assurance that everything possible will be done to find practical solutions for the difficulties in the way of attainment of our production objectives. To this end, the Queensland Government is co-operating actively with the Federal Government and the food control authorities. Satisfactory progress has already been made, and it is my belief that when plans now formulated are fully applied most of the major difficulties will be removed.



Haymaking.

L. M. HODGE.

IN converting a green crop into hay, the objective is to obtain the greatest possible weight of cured material of high nutritive value and attractive aroma without undue loss of colour or palatability. To attain that objective the crop should be of a suitable variety or varieties, free from deleterious weeds, well grown, cut at the right stage, and properly cured.

The stage at which a crop should be cut for hay is shortly after flowering commences, for if harvested in the early flowering stage the crop yields the maximum amount of dry matter of high nutritive value. If the crop is cut too early, the maximum yield will not be obtained, although the nutritive value is particularly high. On the other hand, if cutting is delayed until the ripening of the seed has advanced, the nutritive value of the resultant hay will be appreciably lowered because of increase in woody materials at the expense of proteins and of a decline in digestibility. Oats provide an exception to the general rule, in that they are best cut when a proportion of the seed at the top of the seed-head has ripened and the bulk of the seed is still in the late dough stage.

The method of curing depends on whether the material is coarse or fine, whether it is cut with the reaper and binder or with the mower, and the time of the year at which the crop is harvested. Binding the crop and stooking the sheaves protects the material from damage by rain, preserves the colour by avoiding excessive exposure to sunlight, and reduces losses due to rough handling. Winter-grown cereals are readily cured in this way, but summer crops, when so treated, require careful watching because of the danger of mould development in the centre of tightly-bound sheaves in warm, humid weather.

In curing loose hay, rough and too frequent handling should be avoided to prevent serious loss through the breaking up and powdering of the more nutritious portions of the plant, such as the small leaves and fine terminal parts generally. Losses of this kind are also caused by allowing the hay to become dry and brittle before being put into cocks. These losses are particularly heavy when leguminous crops, such as lucerne, are being handled.

Effect of Weather on Quality.

Naturally, the weather at haymaking time is of vital importance to the quality of the product. While risks cannot be avoided entirely, the farmer usually acquires a degree of weather sense from experience of

his own locality, and he should endeavour to arrange his haymaking to coincide with fine weather. Wet weather will rapidly spoil a crop cut for hay, as the material contains nutrients which are easily dissolved by water and so readily washed out during rain. Excessive drying and exposure to the sun should also be avoided, as they cause loss of green colour and shattering and loss of the valuable leafier parts of the plants.

The best cured hay results from a fairly rapid drying. Evaporation of moisture is facilitated by high air temperatures, sunshine, and wind, whereas high atmospheric humidity retards loss of moisture from the cut crop. If the weather is mild and windy, curing of loose hay in the windrows may be sufficiently thorough to reduce the moisture content to the desired level, and at the same time yield a fragrant, green hay in the stack. On the other hand, if the weather is hot and the atmosphere dry, or if rain threatens, the swaths should be raked and put into cocks as soon as practicable.

Hay should be stacked or baled before it becomes brittle, otherwise serious losses will occur because of shattering and powdering; and, in addition, the chaff made from dry hay contains an undue amount of irritating dust. If stacked or baled when too damp, however, the hay will heat, develop moulds, and spoil. In cereal or other grassy hays, the upper nodes or joints of the straw should be dry before the hay is put into stacks or bales. Where the hay is stooked, a sample for examination before stacking or baling should be drawn from the inside of a central sheaf, and, where the hay is loose, from the inside bottom of a cock. Various moisture tests for lucerne hay are described in a Departmental leaflet on lucerne-growing.

Coarse salt may be sprinkled over the layers as they are built into the stack. This increases the palatability of the hay.

Haystacks should be well built according to the directions given later in this article; they should be situated above flood-level, and protected securely against rain, fires, and vermin. While hay will keep for several years if properly stacked it deteriorates with age, and it is a good plan to feed or otherwise dispose of stacks when they are three years old, replacing them with new hay.

Hay may be baled as an alternative to stacking, and in this form it is easily handled, transported, and stored. Baled hay is the only form of hay for which a large demand exists in the produce market. Care must be taken that hay baled direct from the field is sufficiently cured, otherwise heating may occur under high pressure and the product be ruined.

CROPS SUITABLE FOR HAYMAKING.

Crops used for hay purposes in Queensland may be divided for convenience into summer-grown and winter-grown crops. The former comprises Sudan grass, saccharine sorghums, Japanese millet, white panicum, giant setaria, lucerne, and cowpea; while the main winter-grown crops are wheat, oats, barley, canary seed grass, field pea, and vetches or tares. In addition, native and cultivated pastures are at times harvested for hay, and occasionally the peanut is used for the same purpose. The most valuable hay crop is lucerne, which persists for a number of years, produces several cuttings each season, and yields a hay of high nutritive value. Of the annual hay crops, Sudan grass and wheat are the most important. Japanese millet, white panicum,

and giant setaria do not yield as heavily as Sudan grass but are better dual-purpose crops, in that they may be grazed at any stage of growth without danger to stock.

The sowing of either summer-grown or winter-grown hay crops should always be preceded by a period of bare fallow, during which weeds are eliminated, moisture is conserved, and soil fertility is improved by decomposition of organic matter. A gradual working down of the land to a fine tilth should be aimed at, but care should be taken not to expose the land unduly to the erosive action of water. Finally, the preparation of a fine, firm seed-bed to assure a rapid, even germination of the seed is essential.

In the drier inland agricultural areas, where soil moisture is the principal limiting factor to crop growth, ploughing should be completed several months in advance of sowing. In districts where the rainfall is more regular and abundant, later ploughing and consequently a shorter fallow period may be adopted. The fallow period, however, should always be sufficiently long to assure that a proper tilth is achieved by sowing time.

Summer-grown Crops.

The time of sowing of annual summer hay crops should, if possible, be so arranged that these crops, which are usually ready for cutting in six to nine weeks, do not reach that stage during the height of the summer rains. Lucerne should be sown in April or May.



Plate 1.

HARVESTING A CROP OF SUDAN GRASS IN CENTRAL QUEENSLAND.

Sudan Grass.

Sudan grass is normally a hardy annual, although it may persist for two or even three seasons under frost-free conditions; nevertheless, it is generally unprofitable to persist with a crop of Sudan grass beyond a single season. Thick-stemmed plants of Sudan grass are difficult to cure, and it is advisable, therefore, to make a heavy sowing of seed in order to induce the production of a fine-stemmed crop. The seed is preferably drilled, using every grain run, at the rate of between 10 lb. and 12 lb. to the acre, but it may be broadcast at the rate of 20 lb. to the acre and covered by harrowing.

The crop (Plate 1) may be cut with the reaper and binder, in which case the sheaves should be put immediately into small stooks permitting free circulation of air around the sheaves. A very succulent crop tied by the binder may spoil in the sheaves, no matter how carefully it is cured, and such a crop is best harvested with a mower or with a reaper, the bundles in the latter case being tied by hand after wilting has occurred. If cut with the mower, the crop should be wilted in the swath and in the windrow and further cured in cocks, which should be of small size if the weather is cool or cloudy.

Sudan grass at all stages before flowering is regarded as potentially dangerous to stock, but the cured hay, made from a crop which has just flowered, is generally considered to be safe as a stock food. The regrowth should not be cut for hay until the crop has once more flowered.

Saccharine Sorghums.

The saccharine sorghums are grown almost entirely for green feed or for silage, since they are difficult to handle and to cure as a hay crop. If sown for hay, broadcasting of the seed is preferable to sowing in drills, since a more slender type of plant will be developed. The sowing rate should be between 15 and 20 lb. to the acre. They are best cured in bundles in the field and stacked subsequently on end in a slanting position. They make a very coarse hay, which should be chaffed before being fed to stock; even when chaffed, however, the hay is very hard on the mouths of the stock to which it is fed and has little to recommend it.

Milletts.

The millets, including white panicum, and giant setaria are quick-growing, hardy annuals, which are able to make satisfactory development under fairly dry conditions. The seed should be drilled or broadcast at the rate of 10 lb. to 15 lb. to the acre. Because of their succulent nature, the millets take longer to cure than giant setaria, but they make excellent hay when they are cured. White panicum makes a particularly fine hay. All of the group have a free-seeding habit and, if allowed to mature their seed before being cut, may cause a lot of trouble in succeeding crops. If they are cut in the flowering stage, however, no trouble is experienced. A crop cut before maturity will usually make a second growth useful for grazing.

Lucerne.

The culture of lucerne for hay purposes is described in a Departmental leaflet on lucerne-growing, and only a general outline of the haymaking process is given here. Probably no other hay crop requires such skill and attention to detail during the curing processes as does lucerne. Lucerne hay, to command the highest price on the market, or to be of greatest value to the grower as a form of conserved fodder, should be bright-green in colour, fragrant, and contain a large proportion of leaf. It should be free from weeds and rubbish and contain a minimum of dust or other irritating matter. The principal mistakes causing losses in yield or in quality are cutting too early or too late, not curing sufficiently, and over-curing.

The crop should be cut in the early flowering stage. If cut earlier, the maximum tonnage is not obtained, and if cut too late much of the lower leaf is lost, the stems become woody, and the quality of the hay suffers accordingly. In addition, late cutting delays the growth of the succeeding crop and may result in the loss of one cutting during the

season. Lucerne should be cut with a mower, as it is too succulent to admit of being bound and stooked. If the crop is wet from dew or rain, cutting should be delayed until the surface moisture has evaporated.

In fine weather, the swath may be raked into windrows two or three hours after cutting. The operation should not be delayed until the plants have become dry and brittle, as they may then lose sufficient leaves to lower seriously the quality of the hay. The windrowed material, further, should be put into cocks before the leaf is dry enough to shatter. To obtain the maximum shading with the freest circulation of air and to protect the cocked material from rain damage, the cocks should be built tall and narrow. It is advisable to inspect the cocks each day while curing proceeds and to open them if mould development threatens. Sometimes the top half of the cock is lifted off, placed on the ground, and the bottom portion inverted on it. In fine, hot weather two days in the cock should be sufficient, but this period may be extended to four days if the weather retards moisture evaporation.

The cocks should not be stacked until the moisture content of the lucerne is reduced sufficiently to prevent spoilage in the stack. The lucerne hay should be stored in a shed, but if it is necessary to stack it in the open the stack should be protected from rain, otherwise some wastage will occur.

Cowpea.

The cultivation of cowpea is described in a Departmental leaflet. The hay is rather difficult to cure satisfactorily, because of the different rate of drying of leaf and stem. If allowed full exposure to sun and wind, the leaves dry progressively from brittle-green to brown and finally drop off while the coarser stems are still moderately succulent. To counteract this, it is necessary to select a fine-stemmed variety and to sow broadcast at the rate of 30 to 50 lb. per acre, with the object of inducing the development of fine stems. The sowing rate will, of course, depend on the size of the seed of the selected variety. Victor and poona are the most suitable varieties for hay purposes, both being relatively fine-textured and capable of producing heavily.

The art of curing the crop lies in inducing the leaves to retain their normal function sufficiently long after cutting to drain the moisture from the stems. This is done by judicious cocking as soon as practicable after cutting, in order to prevent the leaves from withering while the stems are still sappy. The crop should be cut with the mower when the pods have become fully developed, but before they commence to ripen. It should be turned frequently, if the hay is being made on the coast, before being put into cocks which should be tall and narrow to permit as free circulation of air as is possible. In drier inland districts, such as the Callide Valley, and on the Darling Downs, however, during hot sunny weather the crop may be put direct into very small cocks from the swath after a few hours of wilting. As drying proceeds, the cocks should be made larger by inverting one on top of another, repeating the process until each cock consists of three or four of the originals. They should be as tall and as narrow as possible. Before stacking the cocks, the stems should be carefully examined for excessive moisture. Under good growing conditions, a yield of 2 tons to 4 tons of hay per acre may be expected.

Winter-grown Crops.

The cereals—wheat, oats, barley, and canary seed grass—may be planted over a wide period, but mainly from March to June, although

canary seed grass sowings may be made satisfactorily as late as August. The best harvesting months for cereal hay crops, however, are August and September, and it is advantageous to arrange the main sowings to mature for hay during those months. Varieties differ a good deal as regards the time required to reach the early-flowering stage. Early, i.e., quick maturing varieties may be ready to cut in three months, while late, i.e., slow maturing, varieties may require about four and a-half months; so that an early wheat should be sown in June for harvesting in September, while a late variety would need to be sown in April or May. May is the best month for general sowings to be made.

Winter-grown leguminous hay crops should be sown in early autumn, as it is desirable that they be harvested before they suffer a setback because of dry conditions during the spring months.

Wheat.

Wheaten hay is usually converted into chaff before being marketed or fed on the farm, and the aim in haymaking is to produce a hay which will yield a good quality chaff. The principal factors controlling the character of the hay are season, soil, husbandry, curing practices, and variety.

To be of good quality, wheaten hay should be made from a well-grown crop, and it is advisable, therefore, to cut the main hay supplies in good seasons rather than in poor seasons. Loamy soils of high fertility produce a hay of good body and of high nutritive value; while poor, light soils often develop a crop curing into a light, inferior hay. Cultural practices should aim at the provision of favourable soil conditions and the elimination of weeds.

The ideal variety of hay wheat should possess certain characters which are not of primary importance in a grain crop. It should be capable of heavy production of green material, possess a stout-walled straw which will cut into a clean heavy chaff, have straw and flag of a brighter green colour, and be devoid of awns and dark-brown coloration of the ears. Further, the variety should possess a high degree of resistance to stem and leaf diseases. The main hay varieties in use in Queensland are Clarendon, Warren, Florence, and Warchief.

The general rule in regard to rate of sowing is that a lighter rate should be used where soil moisture is likely to be deficient at some stage of the growth of the crop than where ample soil moisture is available. The sowing rate for a hay crop is heavier than that for a crop sown for grain, since a longer straw is desired. The available moisture will usually support the denser plant population, because the hay crop occupies the land for a considerably shorter period than does a grain crop. The average sowing rates recommended for sowing from April to mid-May are 45 to 55 lb. per acre, and for later sowings, 55 lb. to 65 lb. per acre.

The period required for germination of the seed in a warm moist soil is five or six days, and the depth of planting should be sufficient to ensure that the seed is in contact with moist soil for that period. In most soils from 2 inches to 2½ inches is a suitable depth, but the seed should be planted deeper if the soil is likely to dry out to a depth of 2 inches in a short time.

The grazing of wheaten hay crops in Queensland is not recommended, except where a rank, sappy growth is developed by the young crop. Grazing may safely be practised only when the crop is in the grassy stage and before the seedheads commence to form inside the leafy shoots. If the shoots containing the developing seedheads are grazed off, subsequent growth of the plant is mainly from less advanced shoots, and a good hay crop is not formed. The presence or absence of the miniature seedhead may be ascertained by splitting open some of the most advanced leafy shoots.

The correct time to cut wheat for hay in order to obtain the maximum yield, consistent with high nutritive value, is not later than eight days after the wheat crop has flowered. Cutting with the reaper and binder not only effects a saving of labour, but also favours the production of a hay of good quality. At least two rounds should be cut before the outside of the crop which has been trodden by the horses, is harvested. If portions of the crop are to be left for grain, firebreaks may be formed by a judicious choice of the areas harvested for hay.

The sheaves should usually be large and firmly bound, as this ensures that a large proportion of the hay is protected from the bleaching action of the sun. If the crop is sappy, small sheaves are advisable in order to guard against mould development. The sheaves should be stooked as soon as possible after cutting, and it is a good practice to have the stooking gang keep pace with the binder. For this purpose, one man per ton of hay per acre is necessary if the reaper and binder is in operation all the time. The average number of sheaves which should be placed in a stook is twenty, but a lesser number is desirable if drying conditions are not good. The long, narrow type of stook is considered preferable to the round stook in the wetter districts.

Sheaved hay cured in stooks is usually ready for stacking in about fourteen days, but this time is only approximate and the hay should be stacked as soon as the upper joints of straws drawn from the middle of the sheaves are dry. Over-exposure of the sheaves in the stooks tends to make the hay hard and brittle, with a lowering of the quality of the chaff.

When hay is being chaffed for marketing purposes, all mouldy or inferior sheaves should be discarded, and the chaff placed in clean, sound bags neatly branded. If chaffed in very hot, dry weather, wheaten hay tends to shatter and powder. It is advisable, therefore, to cut the chaff in humid weather or, when practicable, to apply high-pressure dry steam to the hay as it is being chaffed. The blades of the cutter should be kept sharp and should run close against the face plate, otherwise the chaff will be broken, uneven, and unattractive.

Oats.

Although oats are widely grown for grazing and green fodder in Queensland, the amount of oaten hay produced is small, and very little local hay is marketed. The crop tends to be somewhat coarse and rank in Queensland and is liable to lodge during wet weather but its main disability is the susceptibility of the varieties in use to rust.

Oats may be sown from February to June, but it is usually desirable to sow during the March rains in order to secure a cutting for hay in late August or during September, when the weather is favourable for haymaking. In the southern districts, a long-season variety, such as

Algerian, if sown early, will usually give a winter grazing and a hay cut in the spring. Early maturing varieties, such as Sunrise, Mulga, Belar, Buddah, Fulghum, and Palestine, are preferable in the central district, where the spring is usually extremely dry.

The rate of sowing varies between 40 and 80 lb. per acre when drilled, with somewhat heavier sowings when broadcast. Lighter sowings give a greater margin of safety under dry conditions. Coarse-stemmed varieties should be sown at a heavier rate than fine-stemmed varieties in order to reduce the thickness of the stems.

As with wheat, grazing should not be permitted except on rank-growing crops, and then only during the tillering stage. Less vigorous crops should not be grazed, and stock may destroy an undue proportion of plants on loose, open soils by pulling them out of the ground.

The proper stage at which oats should be cut for hay is when the bulk of the seed is in the late dough stage. This is indicated by the top seeds on the seedhead turning white. The chief reason for delaying the cutting of oats for hay until after flowering has ceased is that chaff buyers prefer oaten chaff containing grain. The purplish-green colour of chaff prepared from oaten hay cut in the late dough stage is taken by buyers as an indication that harvesting was done before the seed ripened and shattered.

The curing of oaten hay and its conversion into chaff follow the practices adopted in the case of wheaten hay and chaff.

Field Pea.

The field pea gives best results as a hay crop when grown on fertile, well-drained soils in districts where ample winter rainfall and mild spring conditions usually prevail.

If sown alone, about 60 lb. of seed to the acre is generally used, care being taken to plant fairly deeply, between $2\frac{1}{2}$ inches and 3 inches being the best depth at which to sow.

Although the field pea is a hollow-stemmed plant, the hay is rather difficult to cure. In general, the directions given for the curing of lucerne hay should be followed. The field pea is more easily harvested and cured when sown in admixture with oats or wheat than when sown alone. Because the pea seed germinates better at a slightly greater depth than is usual for the cereals, the former should be sown first. An average planting rate is 20 lb. of field pea to 40 lb. of wheat or oats. Lighter sowings than these are preferable where growing conditions are likely to be unfavourable.

Vetches or Tares.

The climatic range of vetches or tares is similar to that of field pea. They make an excellent hay and are more easily cured than is field pea; nevertheless they are but little used in Queensland. As a hay crop, they are best sown with a strong-stemmed wheat which serves to keep the vetches or tares off the ground and also facilitates harvesting. The legume and cereal seed are best sown separately, at the rate of 20 lb. of vetches or tares to 40 lb. of wheat per acre. When vetches or tares are grown with wheat, the usual practice is to cut the mixture when the wheat has reached the correct hay stage, although at this time the legume generally has not commenced to flower.



Plate 2
WHEAT AND VETCHES

PASTURE HAY.

Conservation in the form of hay of excess growth produced by pastures during the summer growing season is practised to some extent, and occasionally, after a good winter, hay is made from certain winter-growing pasture plants, such as prairie grass and ryegrasses. The most

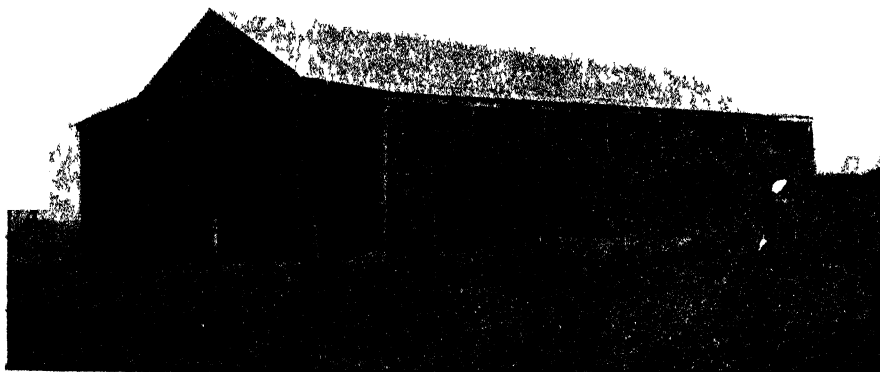


Plate 3.
A WELL FILLED HAY SHED.

productive of the pasture grasses utilised for hay is Rhodes grass, a native of Africa, widely used in Queensland as a pasture. Many of the native grasses make a satisfactory class of hay if cut at the proper time, correctly cured, and securely stacked. The chief of these are the various blue grasses, star grasses, Mitchell grasses, and Flinders grasses, most of which often occur in almost pure stands. It is advisable to utilise for hay only pastures growing on good soils, as these may be expected to comprise the more valuable grasses, to yield well enough to repay the cost of haymaking, and to be of satisfactory nutritive value.

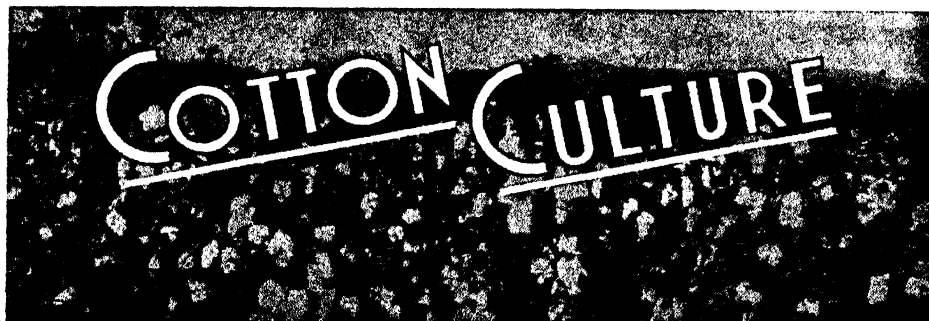
The correct time for cutting pastures for hay is during the flowering period, and as this stage may not occur more than once during a year and is then very brief, only a very short space of time is available for harvesting. Native grasses outside the wet tropics usually possess much fine leaf matter, from which nutrients may easily be lost by improper curing. The swaths should be raked into windrows immediately after cutting. If the weather is sunny and windy, the hay may be stacked direct from the windrow, but in very hot, dry weather the period of curing in the windrow should be materially reduced and the hay put into cocks in order to prevent excessive drying and powdering. It is essential to stack the hay as soon as it is ready, otherwise deterioration through over-exposure will occur. A liberal sprinkling of coarse salt on each successive layer when stacking will improve the palatability of the hay. Stacks should be protected from rain by a galvanised iron roof.

[TO BE CONTINUED.]



Plate 4.

THE GRAIN IS IN THE BAG.—Time for a “blow” on a Queensland wheat farm.



Trials of Rotations with Cotton at the Biloela Research Station.

W. A. R. COWDRY, Acting Manager, Biloela Research Station.

SINCE the establishment of the Biloela Research Station in the Callide Valley in 1924, the merits of various cropping rotations for the district have been investigated at that centre. The soils at the Research Station consist of the usual range of sandy loams to clay loams typical of most farms on the alluvial flats adjacent to the creeks in the district. The investigations in cotton rotations herein summarised were conducted on the heavier dark-grey clay loams originally timbered with a mixture of red gum, large box, and ironbark trees. These soils are well supplied with the plant foods required by fodder crops and cotton. It is believed, therefore, that the results obtained are applicable to the loams and heavy clay loams of both the forest and scrub series in most of the cotton-growing districts south of Mackay.

No.	Rotation.	No. of Years of Cotton Yields.	Gain in Seed Cotton per Acre over Corresponding Controls.	% Increase in Yield.
			Lb.	
1	Cotton-Sudan grass	10	38	8.85
2	Cotton-Sorghum	11	5	1.09
3	Cotton-Giant setaria	7	45	10.14
4	Cotton-Maize	11	25	5.45
5	Cotton-Peanuts	5	-18	-2.23
6	(Cowpeas-Wheat), Maize, Cotton	5	131	26.80
7	(Fallow-Oats), Maize, Cotton ..	3	6	1.11
8	Giant setaria-Cotton-Cotton—			
	Cotton in 1st year	8	133	34.54
	Cotton in 2nd year	8	78	20.47
9	Rhodes grass (3 years) Cotton—			
	Cotton-Cotton—			
	Cotton in 1st year	6	9	1.95
	Cotton in 2nd year	4	163	24.23
	Cotton in 3rd year	3	111	22.76

At the time of the inception of the Research Station, the Callide Valley was pastoral country newly opened for closer settlement, and it was generally considered from the experiences of farmers in adjacent districts that cotton growing, in conjunction with dairying, would be the basic industries practised in the new settlement. Accordingly, most of the rotations first studied consisted of a fodder crop grown in rotation

with cotton, although cash crops such as peanuts and potatoes were also included. As the results from these rotations became available, a better understanding was obtained of the problems involved in cotton growing and modifications of the programmes were made, so that the various rotations have been of different duration. It is believed, however, that each rotation has been tested over a sufficient number of seasons to yield results indicative of its merits.

The results obtained from the various rotations tested are presented in the following table. In each case the average yield of seed cotton produced in the rotation is stated as a gain or loss over the average yield obtained from the companionate cotton following cotton "control" plots and is also expressed as a percentage of the average yield of the control plots, thus making the results comparable.

The following notes have been compiled from observations made and results obtained in the various rotations mentioned in table on page 17.

No. 1.—Cotton cropped alternately with Sudan grass has given slightly better yields than the control plots continuously planted to cotton. The difference between the two rotations has always been larger in a season with low mid-summer rainfall, when the "control" plots have suffered more severely during the stress periods.

No. 2.—Cotton cropped alternately with sorghum has given no consistent increase in yields in more sandy soils, though on the Station, where similar rotations were established, considerable gains of cotton have been obtained in some seasons. Saccaline has been used as the sorghum crop in the majority of the tests of this rotation, but grain sorghum varieties have been substituted recently, in view of the interest being taken in this crop in the district.

No. 3.—Giant setaria (giant panicum) was selected for trial in the rotations because of its ability to produce a profitable crop of hay quickly, thus providing an opportunity to plough under a fair amount of stubble during the early autumn. This fodder crop has, like Sudan grass, proved to be of greater value in increasing the yield of the following cotton when the latter crop experienced a dry season, more especially if heavy yields were obtained from the fodder crop.

No. 4.—The yields of cotton grown alternately with maize have mostly been similar to those in other rotations with fodder—i.e., slightly improved yields were obtained.

No. 5.—This cotton-peanuts rotation was discontinued when it became very evident that peanuts or any other legume markedly promoted rank growth in the following cotton crop, such growth being accompanied by poor yields.

No. 6.—A rotation in which cowpea, wheat, and maize preceded cotton in that order—the four crops being grown over three years—was studied for five seasons. The two grass crops following the legume were apparently able to reduce sufficiently the additional nitrogen provided by the cowpea to levels favourable for cotton as a mean gain of 131 lb. per acre was secured over the control. A variation of this rotation may be useful on the less fertile soils of the forest series.

No. 7.—In this three-year rotation, oats was planted after a summer bare fallow and was followed by maize and then cotton. Poor seasons were encountered in the first two of the three seasons during which it was carried out and yield increases in seed cotton were practically nil. Because of the expense incurred in maintaining a bare fallow throughout the summer, this rotation was discontinued.

No. 8.—In this rotation two crops of cotton followed a single crop of giant setaria. As would be expected from similar rotations with fodder crops, appreciable gains were obtained only when the cotton following giant setaria was grown in relatively dry weather.

No. 9.—The rotation in which cotton is planted for three seasons following a three-year growth of Rhodes grass has been in progress for several years, both in these series and in a number of other tests on the different soil types on the Research Station, and has proved to be consistently sound. In the first year following the break-up of the Rhodes grass, the growth of the cotton and also the yield from the crop may be depressed if the grass is not ploughed before June or July. This effect is apparently due to a temporary lack of nitrates in the soil. The average yield in the first year after Rhodes grass over this series of tests was markedly reduced by a very adverse result obtained in one season. In most seasons, appreciably higher gains over the controls were produced, as was also true in tests on the other soil types on the Research Station. However, the second and third crops of cotton have given consistently high returns, the gains being greatest when the poorer sandy clay soils of the Research Station are considered separately.

The results of investigations conducted over several years have appeared to indicate that the beneficial effects obtained in a Rhodes grass-cotton rotation are due to the more permeable surface soil in the cultivations after ploughing a three years' stand of Rhodes grass. Efficient penetration of storm rains is thus secured, and this provides the cotton crops with sufficient moisture to withstand all but severe prolonged dry periods. In addition, a balance of plant foods more favourable for the production of profitable crops of cotton is maintained in the soil by this Rhodes grass-cotton rotation than in any of the other rotations tested.

The results obtained in the tests have demonstrated that where cotton is grown in alternate rotation with some form of fodder crop, the gains realised in the cotton have not been satisfactory and in some seasons the yields of the fodder crops have been unprofitable. Likewise, where cotton has followed two fodder crops preceded by croppings which provided subsoil moisture and additional nitrogen for the fodder crops, the cost of production of the fodder crops has made the returns realised unprofitable when compared with those obtained from the cotton-Rhodes grass rotation. Where cotton has been grown for three seasons following three years' growth of Rhodes grass, better yields of cotton have been obtained than in the other rotations tested, and, in addition, a satisfactory amount of grass for either hay-making or grazing has been cheaply produced. It is recommended, therefore, that all cotton-growers investigate thoroughly the merits of this rotation on their properties.

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FRUIT CULTURE

Marketing Plums.

JAS. H. GREGORY.

IN recent years, growers have developed plum varieties, which have shown great improvement in quality. This development and improvement have placed the trade in this fruit on a very firm foundation. No longer is the plum considered as just another jam fruit. It is now accepted as one of the choicest of the dessert stone fruits.

Although careful handling and care is necessary when sending in plums for factory use, it becomes absolutely essential to take every precaution to prevent damage when plums are being harvested and packed for the fresh fruit market. Even minute skin injury may mean increasing the risk of brown rot development, which would result in the subsequent breakdown of the fruit and heavy loss.

Maturity.

One of the most important considerations with all stone fruits is correct maturity at the time of harvesting. With plums, if consignments are to travel long distances, it is necessary to use every care in the selection and harvesting of fruit. Stone fruits are best left to ripen as much as possible on the trees. Because of the long distances the Stanthorpe district is from many of the points of disposal, it is not possible to market tree-ripened fruit successfully. Plums have, therefore, to be harvested when fully matured but not ripe. The ground colour of the fruit is the best indication of maturity. If plums are to be sent long distances, lesser coloured fruit is selected, the more highly coloured specimens being used for the nearer markets. Before harvesting, plums should show a pronounced development of colour. Coloured and dark varieties should be showing at least one-third colour development. The maturity of the light varieties is indicated by the change in the ground colour of the skin from a dull green to a brighter translucent yellow green or full yellow colour, according to the variety.

Plums harvested while still too green will not ripen satisfactorily in any circumstances. It is a greater fault to market under-matured fruit than over-matured fruit. Both cause slow sales in the market and tend to cause stagnation, but immature fruit has the added disadvantage of causing, through its unpalatability, consumers to lose their taste for that particular fruit and a consequent lessening of the demand.

Harvesting.

The plums should be allowed to develop to a satisfactory degree of maturity before being taken from the trees. Baskets or specially made

picking containers should be used. A satisfactory picking bucket can be made from a kerosene tin cut lengthways and fitted with a handle, or with a strap to hang over the shoulder. The plums should be carefully placed in the picking container and the same care taken when transferring the fruit to the orchard boxes. The boxes should be carefully placed on the shady side of the trees to protect the fruit from the heat of the sun. The orchard boxes should be transported to the packing shed as soon as possible after being filled and there stacked in a cool place with spaces left for cool air to flow between the boxes. When the fruit is cool, packing may be commenced. If these precautions, however, are not taken and the plums packed while still warm, the fruit will sweat and tend to generate heat, which will cause premature ripening and a condition favourable to the growth of fungous diseases, thus greatly lessening the life and transportable distance of the fruit.

If serious loss during transport is to be avoided, the greatest care should be taken to prevent skin abrasions. Never at any period of operations should fruit be thrown or dropped into cases or picking utensils. Picking bags are not recommended, except for use in harvesting the hard canning varieties, and even then the utmost care should be taken to avoid damage.

Transit Troubles.

One of the greatest difficulties in the way of successful marketing is the fungous disease of brown rot. This disease attacks the plums during the ripening stage. If weather conditions are favourable for its development, fruit may be affected while still on the trees. The fruit also becomes more susceptible to development of this disease after it is packed in the case. As any injury to the skin facilitates the attack of this disease it can readily be understood that care in handling, while harvesting and packing, is absolutely necessary.

Many fungal troubles are caused by infections present in packing sheds. Growers are, therefore, most strongly advised to take all precautionary measures necessary to keep their packing sheds clean.

Packing Shed Hygiene.

Sheds should be kept cleared of all rejected fruits. They should, in no circumstances, be allowed to contaminate floors, fittings, or cases, because of being allowed to rot. Rejected fruit should be immediately dumped in a pit kept for that purpose.

The shed and implements should be cleaned and disinfected periodically. This may be done by using a solution of "Shirlan" watered on floors. Sizing machines may be rubbed over with the same solution.

If second hand cases are used, they should be inspected for any contamination residue caused by old fruit having gone bad when the case had been previously used. Treatment with "Shirlan" will give added protection against contamination.

Containers.

The most satisfactory case for use is the half-bushel dump case—18 inches long by 7½ inches wide by 8½ inches deep, internal dimensions. Under wartime conditions, growers may have to use other types of boxes, such as the standard half-bushel—18 inches long by 11½ inches wide by 5½ inches deep. These cases can be packed and made to look attractive. No matter which container is used, it is recommended that cases be made up with the openings between the boards of the top, bottom, and sides eliminated as far as possible.

Packing Material.

It is preferable to line all cases when packing fruit for market. This gives the tender skins of the fruit the protection necessary to prevent marking by pressure on the rough grain of the boards.

The use of special wrapping paper, recommended where plums are to be sent long distances, or corrugated cardboard linings for lids, bottoms, or sides while desirable will, of necessity, have to be dispensed with for the duration of the war.

Preparing to Pack.

The standard diagonal pack is recommended. For this pack it is advisable for the fruit to be sized. This can be done either mechanically or by hand. Growers will find that most modern sizing machines are suitable for handling plums, provided that care is used in their operation and servicing. To operate a sizing unit successfully, correct tension should be kept on any conveyor belts, rollers should be adjusted to the heights most suited for any individual type of plum; screws should not be allowed to project and cause damage and ample padding should be placed where fruit is likely to come into direct contact with hard surfaces.

Hand sizing is best carried out during harvesting. Growers, by using a suitable picking container—such as a kerosene tin cut lengthwise or something made up of a similar shape—may rapidly size the fruit in the field. Three cases are placed side by side, the fruit being sized into three dimensions while being transferred from the picking containers to the cases. Large, medium, and small would be satisfactory; after being taken to the packing shed, each size may be placed together on the packing bench. Two sizes are packed from the bench, making, in actual practice, at least six different sized packs to the line of fruit.

Placing all the fruit in one heap and endeavouring to pack each size separately is the least satisfactory method of all. If circumstances make it necessary for this to be done, only one case should be placed on the bench at a time.

Grading.

If a good-brand reputation is to be maintained, grading for quality is necessary. All ill-shapen, gummy, cracked, calloused, poorly coloured, or damaged fruits should be excluded from A-grade packs. B-grade fruit should be sound and only placed on the market while payable prices are being received.

Packing.

Growers will find the diagonal system of packing is the easiest and most satisfactory method of packing plums. The principles will be easy to understand if a close examination of the illustrations is made.

A list of the packs for use in packing the dump half-bushel case is given. Many more are available to growers. For example: fruit packed with the 3-2 pack, which is shown as having six layers, may also be packed 3-2 with seven layers by placing less in each layer. As less fruit is placed in each layer it is easily understood how it is possible to get in an extra one. Other packs may be treated in the same way. The practice of using these other packs is not wrong and does not affect the reputation of a good brand. There are many types and varying shapes of egg- or heart-shaped plums, some pointed and otherwise, also nearly

round. It would not be possible to separate and give the packs for all types. Growers are advised, therefore, to use the packs which suit the particular types of fruit they produce, irrespective of whether they are given in the packing table or not. Using the diagonal pack is the thing to ensure that the fullest protection is given the fruit. Its advantages are—

1. No two plums rest one upon the other but are placed in the pockets of the layer underneath;
2. The height of the fruit in the case can be adjusted by altering the size of the pockets;
3. Fruit has a maximum display value, whether opened on the top or side.

The following table of counts is given:—

PACKS USED FOR PACKING PLUMS IN THE DUMP HALF-BUSHEL.

Case made up the narrow way 18 inches long by 7½ inches wide by 8½ inches deep.

EGG-SHAPED PLUMS.

Pond's Seedling, Giant Prune, Black Diamond, President, &c.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
1½	3-2	8 x 7	7	263
1½	3-2	7 x 7	7	245
1½	3-2	7 x 6	7	228
1½	3-2	6 x 6	7	210
1½	3-2	6 x 5	7	193
	2-2	8 x 8	6	192
1½	3-2	6 x 6	6	180
	2-2	8 x 7	6	180
1½	2-2	7 x 7	6	168
	3-2	6 x 5	6	165
	2-2	7 x 6	6	156
1½	3-2	5 x 5	6	150
	2-2	6 x 6	6	144
2	2-2	7 x 7	5	140
2½	2-2	7 x 6	5	130
2½	2-2	6 x 6	5	120
2½	2-2	6 x 5	5	110
	2-2	5 x 5	5	100
2½	2-1	8 x 7	4	90
	2-1	7 x 7	4	84

HEART-SHAPED PLUMS.

Wilson's, Shiro, Burbank, Narrabeen, Washington, Angelina, Burbank Formosa, &c.

	3-2	11 x 10	6	315
1½	3-2	10 x 10	6	300
1½	3-2	10 x 9	6	285
1½	3-2	9 x 9	6	270
1½	3-2	9 x 8	6	255
1½	3-2	8 x 8	6	240
1½	3-2	8 x 7	6	225
1½	3-2	7 x 7	6	210
2	3-2	7 x 6	6	195
2½	3-2	6 x 6	6	180
	2-2	9 x 8	5	170
2½	2-2	8 x 8	5	160
	2-2	8 x 7	5	150
2½	2-2	7 x 7	5	140
	2-2	7 x 6	5	130
2½	2-2	6 x 6	5	120
	2-2	6 x 5	5	110

PACKS USED FOR PACKING PLUMS IN THE DUMP HALF-BUSHEL CASE
MADE UP THE WIDE WAY.

18 inches long by $8\frac{3}{4}$ inches wide by $7\frac{1}{2}$ inches deep.

EGG-SHAPED PLUMS.

Pond's Seedling, Giant Prune, Black Diamond, President, &c.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
1	{ 5-4	7 x 6	5	293
	{ 5-4	6 x 6	5	270
	{ 4-3	8 x 7	5	263
$1\frac{1}{4}$	{ 4-3	7 x 7	5	245
	{ 3-3	8 x 8	5	240
$1\frac{1}{2}$	{ 4-3	7 x 6	5	228
	{ 3-3	8 x 7	5	225
$1\frac{1}{2}$	{ 4-3	6 x 6	5	210
	{ 3-3	7 x 7	5	210
$1\frac{3}{8}$	{ 4-3	6 x 5	5	193
	{ 3-3	6 x 7	5	195
$1\frac{1}{2}$	{ 3-3	6 x 6	5	180
	{ 4-3	5 x 5	5	175
	{ 3-3	6 x 5	5	165
$1\frac{7}{8}$	{ 3-3	5 x 5	5	150
	{ 3-2	6 x 6	5	150
2	{ 3-2	6 x 5	5	138
$2\frac{1}{4}$	{ 3-2	5 x 5	5	125
$2\frac{1}{4}$	{ 3-2	6 x 6	4	120
	{ 3-2	6 x 5	4	110
$2\frac{3}{8}$	{ 3-2	5 x 5	4	100
$2\frac{1}{4}$	{ 3-2	5 x 4	4	90

DUMP HALF-BUSHEL CASE MADE UP THE WIDE WAY.

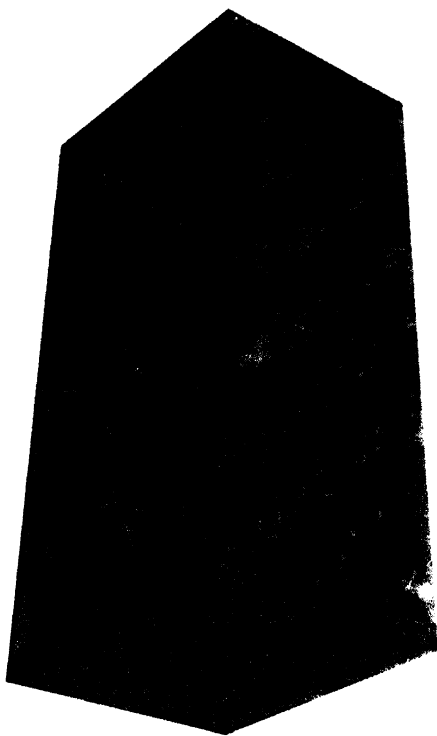
18 inches long by $8\frac{3}{4}$ inches wide by $7\frac{1}{2}$ inches deep.

HEART-SHAPED PLUMS.

Wilson's, Shiro, Burbank, Narrabeen, Washington, Angelina, Burbank Formosa, &c.

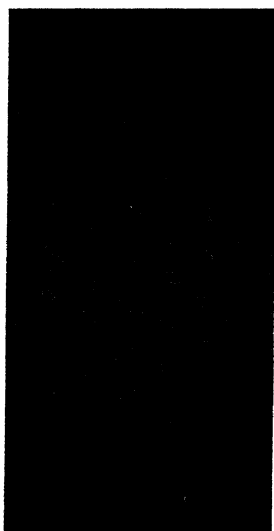
Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
	5-4	9 x 9	5	405
	5-4	9 x 8	5	382
	5-4	8 x 8	5	360
	4-4	9 x 9	5	360
	4-4	9 x 8	5	340
1	4-4	8 x 8	5	320
$1\frac{1}{4}$	4-3	9 x 9	5	315
$1\frac{1}{4}$	{ 4-4	8 x 7	5	298
	{ 4-3	9 x 8	5	290
$1\frac{1}{2}$	{ 4-4	7 x 7	5	280
	{ 4-3	8 x 8	5	280
$1\frac{1}{2}$	{ 4-3	8 x 7	5	263
	{ 4-4	7 x 6	5	260
$1\frac{3}{8}$	4-3	7 x 7	5	245
$1\frac{1}{2}$	4-3	7 x 6	5	228
$1\frac{7}{8}$	4-3	6 x 6	5	210
2	3-3	7 x 6	5	195
$2\frac{1}{4}$	3-3	6 x 6	5	180
$2\frac{1}{4}$	{ 3-3	6 x 5	5	165
	{ 3-2	7 x 6	5	163
$2\frac{3}{8}$	{ 3-3	5 x 5	5	150
	{ 3-2	6 x 5	5	138
$2\frac{1}{2}$	{ 3-2	5 x 5	5	125
	{ 3-2	6 x 6	4	120
$2\frac{3}{8}$	{ 3-2	6 x 5	4	110
	{ 3-2	5 x 5	4	100
$2\frac{1}{2}$	{ 3-2	5 x 4	4	90

FINISHED CASE.



3-2 Pack. 7 Layers. 6×6 Layer Count. Total 210.
Plate 5.

FIRST LAYERS.



3-3 Pack.

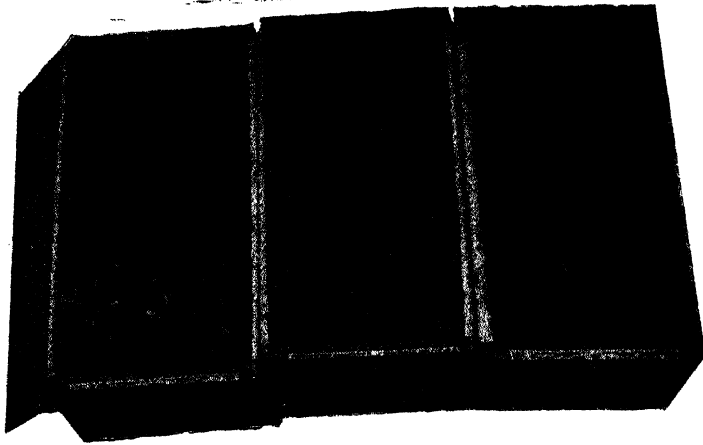


4-3 Pack.
Plate 6.



5-4 Pack.

FINISHED CASES.



4-3 Pack.

4-4 Pack.

5-4 Pack.

Plate 7.

STAYING STRAINER POSTS.

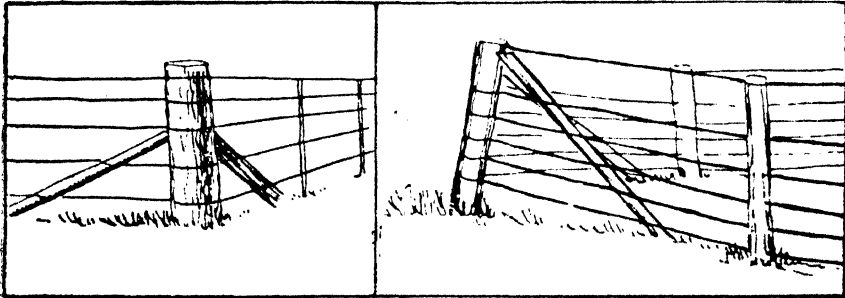


Plate 8.

These illustrations show right and wrong methods of staying strainer posts in a fence. Posts stayed from top are likely to be lifted out of ground, whereas those stayed at middle will remain rigid. Problem is one of mechanics, rather involved because of multiplicity of forces to be taken into account.

Wires tend to pull post over, direction of force they exert being more or less parallel with ground surface. Ground does not exert an actual force, but it offers a resistance, which is equivalent to a force butted against the post at the surface, and another helping force on the opposite side right down at the base of the post—3½ ft. underground.

These particular spots or areas are those where soil is compressed when the strain is put on wires. Direction of these forces is also more or less parallel to ground. Together they act in opposition to the pull of the wires. Next comes effect of stay. It does not exert an actual pull, but offers resistance which is converted by pull of wires into a force acting in direction of the stay itself upward.

Therefore, steeper the angle of stay, more upward its thrust, and greater the tendency to lift post out of ground. Ability of strainer to resist this upward pull depends upon the hold it has in ground.

When the stay is at the middle, it is not at such a steep angle—assuming stay to be of the same length as before—and upward thrust is less. Point where stay butts against strainer becomes a fulcrum, or pivot, so that strain of the bottom wires can be used to counter-balance pull of top wires. This lessens load or pull on ground.

Vegetable Production

The Choko.

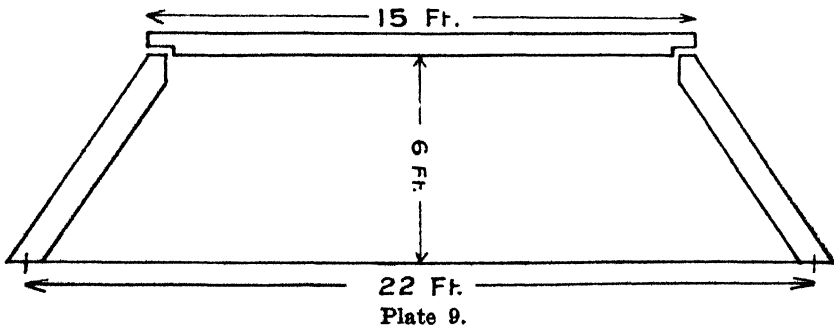
C. N. MORGAN, Fruit Branch.

THE Choko is a popular vegetable grown in coastal districts in Queensland for market, and it is also an excellent vegetable for the home garden as the climatic conditions are most suitable. It is an herbaceous perennial creeper, resembling the climbing cucumber, and given satisfactory treatment is a robust grower in the warmer months of the year. During the cold weather of July and August the plant temporarily dies back.

While in growth the plant forms under the ground a large tuberous root, and it is from this that growth starts in the spring. This process, with good cultural treatment, will go on for many years, and therefore a grower must ensure, if he intends to grow chokos successfully, that his trellises are well constructed in order to last out the life of the plant. The Choko usually improves with age, and therefore during its years of high productivity the breaking down of a badly-constructed trellis is a severe loss.

Trellising.

A strong well-constructed trellis may be made with round timber. Various types of trellises are used, and those illustrated are satisfactory. They can be made as long as desired—say two to three chains. The method of constructing the trellis, shown in Plates 9 and 10, is to set the posts 2 feet 6 inches in the ground with 22 feet between them at ground level and at an angle to allow 15 feet at the top. The tops of the posts are cut level, and the inner corners trimmed, allowing the vertical check of the cross piece to fit tightly against the posts. (See Plate 9.) The height of the trellis is 6 feet. Twelve feet is allowed between posts on each side of the trellis, and the end posts should be well stayed. 12½-gauge wire is stretched along the trellis and attached firmly to the posts at intervals of approximately 15 inches.



SHOWING THE CONSTRUCTION OF TRELLIS DESCRIBED IN FIRST METHOD.



Plate 10

VINES ON TRELLIS BUILT BY FIRST METHOD



Plate 11.

SHOWING TRELLIS BUILT TO SPECIFICATIONS
OF THE SECOND METHOD.

In the second method two rows of strong posts are set vertically in the ground, with a height of about 6 feet, the rows being about 10 feet apart, and the posts about 9 feet apart in the rows. The tops of the posts support cross timbers, on which 12½-gauge plain wire is stretched allowing 15 inches to 18 inches between the wires. Stays support the posts, and wires are also stretched on these.

Planting.

The entire choko fruit is used for planting. Each fruit bears only one seed, which is situated in the base of the fruit. Plants are set approximately 12 feet apart along the trellis. Towards the spring, or almost any time during the warm weather, providing the fruit has reached maturity, the seed will break into growth. When all danger of frosts is passed planting may be done, and should be as early as possible in order to allow the plant sufficient growing time during the warm weather to establish itself thoroughly for the succeeding season. Later planting is sometimes unavoidable, and although no crop may be harvested the first season the plants will be partly established for the next season.

As long as the seed has started to shoot the fruit is ready for planting, and the usual practice is to place the

fruit on its side at an angle of about 45 deg., with the shoot downwards, so that the shoot is about 3 inches to 4 inches below the surface and the narrow end at ground level, or slightly exposed.

Cropping.

Under good growing conditions the plants establish themselves in a short time, and grow rapidly. With the early planting a crop may be harvested during March and April. The following season an early crop will probably set, and will be fit for market during November and December, with the main crop again appearing in March and April.



Plate 12.

HEALTHY WELL-SHAPED FRUIT READY FOR PLANTING.

Fruit may be harvested in between the two crops, but in smaller quantities. It is this condition which makes the choko an ideal plant for the home gardener, as it is very rarely during the greater portion of the year that there are not a few fruit ready for picking. Early crops in some instances are not big, and it is necessary that the plants be plentifully supplied with both food and water when they start into growth to obtain any quantity of fruit at this stage.

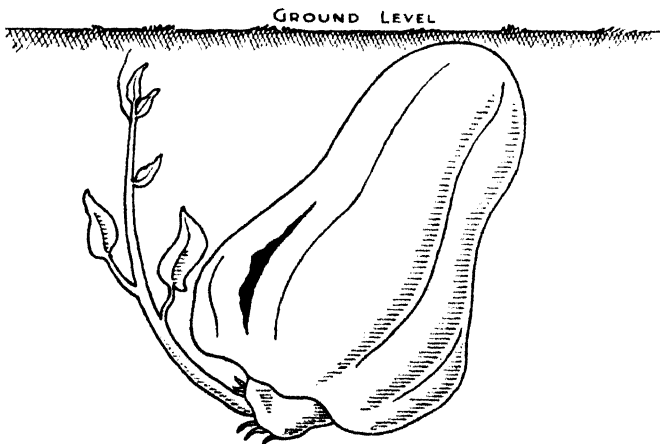


Plate 13.

SHOWING METHOD OF PLANTING.



Plate 14.

TWO STRONGLY CONSTRUCTED BOWERS SUPPORTING HEALTHY VINES.—
Note spread of vines between trellises.

Fertilizing and Manuring.

Although it may appear that this vegetable requires a minimum amount of attention to grow satisfactorily, this is far from true. A successfully grown Choko will produce an abundance of growth and fruit, and in doing so its food requirements are particularly heavy. Farm-yard manures appear to be most satisfactory, and *should be applied in the early spring prior to growth*. As the choko grows very rapidly any subsequently applications of manures are made extremely difficult unless spread under the trellis. It is therefore recommended that sufficient supplies of either fertilizer or manure be made in the spring to last the season. The initial dressing may be supplemented by later applications of a top dressing of fertilizer or manure broadcast around the plants *under* the trellis. It is a common practice even with the spring dressings to place a certain amount under the trellis. As a substitute for farm-yard manure, meatworks fertilizer may be used, or a complete fertilizer containing a good proportion of meatworks. The fertilizer should be applied similarly to and at the same time as recommended for farm-yard manure. Top dressings under the trellis and adjacent to the plants with a quick acting fertilizer high in nitrogen is recommended where the base dressings are of meatworks or meatworks mixtures. One or two top dressings may be done during the season, but one should coincide with the time the main crop is setting during mid-summer.

Eight to ten pounds of fertilizer per plant as a spring dressing when the plants are established should be sufficient with top dressings of 2 to 3 lb. per plant.

Irrigation.

A constant and copious supply of water is essential for good growth, and at no stage must the plants be allowed to lack for moisture. Many



Plate 15.
IRRIGATION LINE LAID OUT UNDER THE VINES.

of the bowers are planned so that a permanent irrigation line is set up under the trellis and is allowed to remain for the season. Thorough soakings are required, and when the plants are in full growth and cover the trellises and the ground in between, the dense foliage tends to lessen evaporation, so that it is not difficult to keep the soil in a moist condition.



Plate 16.
FULLY DEVELOPED MEDIUM-SIZED FRUIT READY FOR MARKET.

Harvesting.

Chokos should be harvested when they are fully developed. They may vary in size according to the type and growing conditions, and should not be allowed to become too old, being picked prior to seed development. They may be marketed loose or packed into clean corn bags, or cases.

Varieties.

There are two varieties—the green and the cream. The former variety is the more popular market type.

CEMENTING LEAKY TANKS.

To cement a leaky tank, iron must first be thoroughly freed of all mud and foreign matter both inside and out. Holes, approximately half an inch in diameter, and spaced 12 inches apart, should then be punched in walls. Wire netting of $\frac{1}{2}$ -inch mesh and 22 gauge should next be lapped around tank both inside and outside, layer for bottom overlapping on walls about 6 inches. Both layers should be laced through holes, using fine tie wire. In case of a large tank bottom must be cemented first, overlapping walls about 6 inches, allow to harden so as to provide a foothold when plastering walls. Before plastering tank should be treated with neat cement wash, thrown on surface by means of a brush. This is to provide a bond between tank and plaster.

Then mix a mortar of one part cement to two parts of fine clean sand, with only enough water to form a stiff, but workable, mixture. Apply in thicknesses of half-inch. When hard, score surface to provide a bond for next coat. Allow each coat to harden, then damp cure for two days by covering with wet bags or similar material. Two more coats inside and outside, making a 3 inch wall, are advisable. Thoroughly moisten each coat before applying succeeding one. Finished work should be cured for seven days before filling with water.

If a tank has only a few holes, it may be made watertight by use of cement wash. Before starting fill all holes with rivets, and clean tank thoroughly. Make a fairly thin mixture of one part cement and two parts fine, washed sand. Use a brush to thoroughly splash sides, and before coat is thoroughly dry put on another. Repeat several times until thickness of $\frac{1}{4}$ to $\frac{1}{2}$ inch has been obtained. For bottom, spread a stiffer mixture of same proportion $\frac{1}{2}$ inch thick, work over with float, and allow whole to dry slowly by protecting with bags.

Almost any receptacle, provided it is substantial, and holes are not too large, can be rendered waterproof by use of following cement wash:—Dissolve one part salt in as little water as possible, and mix into six parts of cement. If necessary, add more water to make mixture take on consistency of thick cream. Holes and seams of vessels to be treated should first be plugged with a less wet mixture of above. The "cream" is then painted over inside and outside of vessel.

A New Zealand farmer advises treating holes from outside with alternate coats of waterproofing paint and cheesecloth as follows:—First apply coat of paint. Then stretch covering of cheese cloth over hole or weak part. Next give another coating of paint. Then a covering of cheesecloth, and finally a covering of waterproofing paint. Where metal around a hole is very thin edges are held in place from inside, while first coats are applied. When various patches have been completed apply coating of the paint to inside of tank.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to the Department of Agriculture and Stock, Brisbane, without delay.

PLANT PROTECTION

Citrus Fruit Rots and Blemishes.

F. W. BLACKFORD, Assistant Research Officer.

FOUR major diseases of citrus were dealt with in the December issue of this Journal, and the attention of growers is now directed to seven other diseases which, while not so important as those already discussed, may nevertheless be a source of quite appreciable loss. The diseases in question are blue mould, brown rot and stem-end rot, sooty mould, smoky blotch or fly speck, oleocellosis or oil spot, rind breakdown, and stylar-end rot of limes; all are responsible for fruit rots or fruit blemishes.

BLUE MOULD.

Known to most citrus growers as blue mould, the two fungous fruit rots, green mould and blue mould, are found wherever citrus is grown. The main difference between the two diseases lies in the colour of the spores of the fungi responsible for the rots, the one producing green spores being the commoner, although very often both may be found together. The two fungi are not active parasites, and both gain entrance to fruit through wounds which may be so small as to be almost invisible; the blue spore disease may, however, also spread from fruit to fruit merely by contact.

The rots are first apparent as a very soft, light-brown, water-soaked area. As this enlarges, a white, cottony mould develops in the centre, and very quickly there is formed a green or blue coating of spores of the fungus, which fly into the air as a cloud when the fruit is touched. In the case of green mould, a fairly wide, well-defined margin of white fungus borders the green area, whereas in the case of blue mould this margin is narrow. The fruit, once infected, decays very rapidly to the final stage, in which it is a mass of soft pulp covered with the green or blue spores.

As the two fungi usually become established in the fruit through wounds, the diseases are most prevalent in wet weather, when the fruit is turgid and easily injured. They are usually encountered in the packing shed and in fruit on the market, but they are quite common in fruit on the tree which has suffered injury by insects, thorns, &c., or has been affected by rind breakdown.

Control.

The most important factor in controlling these rots is the avoidance of injury to the fruit from the time it is harvested until it is marketed; hence the following control recommendations might be summarised in two words—handle carefully. Clippers should be used for harvesting the fruit, a blunt-nose type being the most suitable instrument. With them two cuts should be made, one to remove the fruit from the tree, and the

other to trim the stalk close to the fruit so that no sharp end capable of puncturing other fruit is left. Finger nails should be kept short, and gloves should be worn when handling citrus. Fruit should not be dropped from picking bags into boxes, but transferred to them gently. Picking bags and boxes should be regularly cleaned to free them from sand or soil, and the boxes should be free from rough edges, protruding splinters and nails. The grading plant should have all edges and corners well rounded and padded, and the bins should be cleaned out frequently to remove any stalks, buttons, and grit which may have collected in them.

Once in the packing shed, the fruit should be allowed to sweat before packing, during which process the rind becomes more pliable and less liable to injury than when just picked. At the same time any fruit which has already been injured will almost invariably develop mould and can be discarded. Such decayed fruit should be removed from the packing shed regularly and burned or buried. Fruit, immediately after being picked, may be run through a borax bath, prepared by dissolving 5 to 7 lb. of borax in 10 gallons of water; it is then drained and allowed to dry. However, under Queensland conditions, this treatment will not be necessary to reduce the number of affected fruit, provided the fruit is handled carefully. Wrapping fruit is helpful in cushioning the fruit in the case and in preventing the spread of decay, especially the blue spore type, from an infected fruit to uninfected neighbours.

BROWN ROT AND STEM-END ROT.

Two other fruit rots are occasionally encountered in the wetter citrus districts, and are known respectively as brown rot and stem-end rot. It is very difficult to distinguish between these two diseases, as the appearance of affected fruit is very similar. The rind of diseased fruit in each case develops a dull, light-brown colour, and, when the fungus which causes the trouble penetrates to the pulp, the fruit becomes very squashy. There is no development of spores on the surface of affected fruit, as in the case of blue mould, although, if it is kept very moist in a closed container, a slight growth of cottony fungus may develop.

Brown rot attacks the leaves and twigs as well as the fruit. It is, however, seldom of any serious consequence except in the northern citrus districts. If the disease has been present in previous seasons, cuprous oxide mixture at a strength of 3 in 40 could be applied just before the onset of the rainy season to provide a protective covering for the fruit.

As its name suggests, stem-end rot gains entrance to the fruit through the stem-end. It is caused by the same fungus which produces melanose spots at an earlier stage in the development of the season's crop, and is usually found in orchards severely affected by this disease. If the melanose is checked by the application of the measures recommended for its control, then stem-end rot ceases to be of importance.

SOOTY MOULD.

Sooty mould is not a disease in the generally accepted sense of the term. Its presence on citrus may produce merely a smokiness on the fruit, leaves, or young twigs, or it may be developed sufficiently freely to form a thin, velvety mat of black fungus (Plate 17), which may be

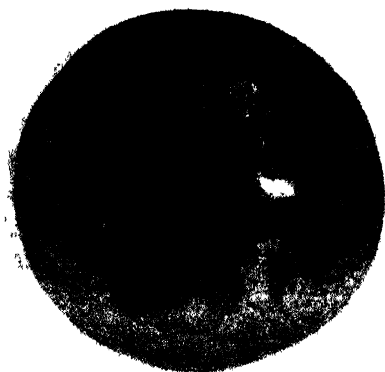


Plate 17.

ORANGE SHOWING DEVELOPMENT OF SOOTY
MOULD.

easily lifted or rubbed off, leaving clean and unaffected tissue underneath. This sooty mould is composed of a number of different fungi, which live on the honey dew or sugary secretions of aphids or certain scale insects infesting the citrus. The fungi do not penetrate the plant tissue at all, which fact explains why no trace is left after the black coating has been removed. The main direct adverse effect produced by the development of sooty mould is the soiling of the fruit and, in heavily-affected trees, the exclusion of sunlight from the leaves.

Control.

When the aphids or the scale insects secreting the honey dew are eliminated, the sooty mould fungi automatically die out and will eventually be removed by the rain and the wind. Appropriate insecticides should therefore be applied to ensure the control of the aphids or the scale insects responsible for the sooty mould development. The mould on affected fruit may be removed by washing it in a mixture of $\frac{1}{4}$ lb. of chloride of lime, i.e., bleaching powder, and $\frac{1}{4}$ lb. of boracic acid in one gallon of water.

SMOKY BLOTCH OR FLY SPECK.

The disease known as smoky blotch may be confused with the skin discolouration caused by the Maori mite or with the early stages in the development of sooty mould. A faint, dull smokiness of the fruit is the first symptom observed in smoky blotch, but, unlike the Maori skin blemish, it can be rubbed off, though not as easily as sooty mould. The discolouration is caused by very fine, dark coloured fungous threads which grow over the surface of the fruit. Sometimes a number of these threads are tightly woven together to produce extremely-small balls of fungus, and it is from these that the disease derives the very descriptive name of "fly speck." Special measures for the control of smoky blotch are not necessary, as it seldom occurs to any extent, and is usually checked by the application of the routine copper sprays.

OLEOCELLSIS OR OIL SPOT.

Although all Queensland-grown varieties of citrus may be affected by oleocellosis, or oil spot, this trouble is of most concern to lemon growers because it is on the lemon that symptoms are most conspicuous. Lemons are usually picked according to size and artificially coloured by acetylene; the areas of rind affected with oil spot, which are roughly circular in shape, retain their green colour when the rest of the fruit has turned yellow in the colouring process. In these green areas, which

are very slightly sunken as a result of cell collapse, the oil glands are raised above the surface, a symptom which can be observed before the fruit enters the colouring chamber. In the case of lemons and other citrus allowed to colour on the tree, a drabness of the yellow or orange colour develops in the affected areas with a characteristic collapse of the surface cells of the rind, thus leaving the oil glands raised above the level of the surrounding tissue (Plate 18).

The collapse of the cells is due to the liberation, on the surface of the rind, of the natural oil from the oil glands by slight bruising or pressure on the fruit. The trouble is most prevalent on very turgid fruit picked early in the morning when wet with dew or after a rainy spell. Fruit picked later in the day, when it has lost some of its firmness, is less affected. Such fruit has more "give," and the oil glands are less easily ruptured.



Plate 18.

OLEOCELLOSIS OR OIL SPOT ON CITRON.—Note the raised appearance of the oil glands. (Slightly enlarged.)

Control.

The recommendations made for the control of blue mould are, in general, also applicable to oleocellosis. Fruit should be handled carefully, and picking should not commence very early in the morning if rain has fallen or the trees have been irrigated during the previous twenty-four hours; a similar precaution should be observed during a period of heavy dews.

RIND BREAKDOWN.

Rind breakdown is a trouble which affects lemons, oranges, and mandarins. There is probably no varietal resistance to its incidence, but in Queensland the Emperor of Canton and Scarlet mandarins, the Joppa orange, and the Villa Franca lemon are most commonly affected, possibly because they reach a susceptible stage of development when conditions are conducive to the appearance of the trouble.

On the orange and mandarin it first appears as a flabbiness of the rind, which collapses, wrinkles up, and loses the brightness characteristic of ripe fruit. Partly to fully-coloured fruit is the most susceptible to rind breakdown. Blue mould almost invariably invades the affected part, and the fruit rots and falls.

On lemons the trouble seems to affect only those fruit which are nearing maturity, i.e., fruit just at or prior to the silvering stage. The first recognisable symptom is a slight loss of green colour in parts of the rind, thus producing a pale, mottled appearance. These lighter-coloured parts collapse, forming slightly-depressed, yellowish-brown areas; the oil glands in these areas are brown in colour, while the tissue between these glands is pale, greenish-yellow. The affected parts may cover as much as three-quarters of the rind of the fruit. In a more advanced stage of the trouble, these portions of the rind which surround the affected parts colour prematurely, and a firm, rather brittle, dark-brown scab, often covered by a clear-brown, gummy exudation, is formed on each sunken area. When artificially coloured by the acetylene or ethylene treatment, affected fruit show the blemish of the second stage more clearly as a dull, dirty-brown colour against the clear-yellow of the healthy rind. The pulp is not affected in any way by rind breakdown itself, but certain rot-producing fungi often invade the fruit in the final stages of the trouble; fruit which is only slightly affected, however, keeps quite satisfactorily, though badly discoloured.

This trouble appears after a rainy spell of about three days' duration or after a prolonged period of heavy dews and high humidity, when the fruit remains wet for a considerable time. Apparently in this trouble the rind absorbs an excessive amount of water, more particularly in those parts of the surface which happen to be minutely cracked. In some way this excessive moisture leads to the liberation of oil within the rind, resulting in the death and collapse of the cells surrounding the oil glands. The rind of the Emperor of Canton mandarin is very susceptible to cracking, and accordingly this variety frequently suffers very severely from rind breakdown.

It seems that it is only when fruit have reached a certain stage of development that the trouble is likely to occur. Thus lemons are most commonly affected in March, while June or early July rains cause damage to the mandarins and oranges. Observations have shown that fruit from young and vigorous or heavily-pruned trees develop a coarse type of rind which is immune to the trouble.

Control.

Measures for the control of rind breakdown have not yet been fully investigated, but the following suggestions may prove helpful:—

- (1) The fruit should be harvested as quickly as possible after it has matured.
- (2) If the trouble has appeared, affected fruit should be carefully culled while packing in order to avoid loss in transit. It is better to hold the fruit a little longer than usual in the packing shed in order to ensure that fruit with a tendency to rot will be discarded.

STYLAR-END ROT OF LIMES.

Although limes are particularly free from disease incidence in Queensland, part of the crop is nearly always affected with stylar-end rot. On affected fruit a small, dry, firm, almost-circular depression, dull greyish-brown in colour, develops in the rind at the base of the "nipple." This sunken patch may enlarge until often a quarter of the surface of

the fruit is affected. Internally there may be a slight breakdown of the flesh, in which small white crystals appear.

Stylar-end rot is not caused by a parasitic organism, but rot-producing fungi may gain entrance to the fruit through the collapsed rind. This trouble manifests itself after a period of hot, dry weather, when the tree is suffering from insufficient moisture. Under such conditions the leaves, transpiring water in excess of the amount being absorbed by the roots, remove some from the fruit, thus producing the typical, basal rind-collapse.

Control.

The incidence of the trouble may be lessened by ensuring that the soil is in an adequately moist condition. The position may be further safeguarded by reducing the amount of nitrogen-rich fertilizers applied to the trees; these tend to produce heavy leaf growth, thus increasing transpiration of water at critical periods. Picking the fruit as early as possible helps to avoid the trouble.

COMMON WILD POISONOUS PLANTS.

Common wild poisonous plants in South-Eastern Queensland include:—

Moreton Bay Chestnut (*Castanospermum australe*), a large tree common in scrubs or rain forests and along creek banks. The pods bear one to several large chestnut-like seeds. In the raw state, these seeds cause severe gastro-enteritis, but the poisonous principle was removed by washing and cooking by the aborigines, who used them as food.

White Cedar (*Melia dubia*), a common tree, especially as secondary growth in paddocks. It is also frequently planted as an ornamental tree. The leaves are finely divided, and the flowers, pale lavender in colour, are borne in large trusses. The berries are poisonous. They are oval and about the size of a small pigeon's egg.

Native Bryony (*Bryonia laciniosa*).—This plant is very common along scrub edges and in newly-felled scrub areas. It is a vine, and the fruits, which are poisonous, are at first green with white wavy stripes, later bright red with the same white wavy stripes.

Thorn Apple or Stramonium (*Datura stramonium*) is a common weed of cultivation. It has rather a rank nauseous smell. The flowers are white or (in one variety) purple, and the seed pod is very prickly.

Green Cestrum (*Cestrum Parqui*).—This plant is very common in vacant allotments about the larger towns, especially about Brisbane, and has caused losses among dairy cows. The leaves and the berries, if chewed, are likely to cause death. It suckers freely from the roots, has greenish-yellow or rather brownish flowers followed by little black berries.

Poisonous Corkwood (*Duboisia myoporoides*) is fairly common, especially as secondary growth in many paddocks in South-Eastern Queensland. The wood is light, the bark corky, the leaves usually are a pale-green, flowers white, and small berries black.

Castor Oil (*Ricinus communis*) is quite common as a weed in vacant allotments about the larger towns, also along creek banks in many bush localities. The mottled seeds are poisonous, and though the source of true castor oil, they contain a poisonous principle.

Milky Mangrove (*Excoecaria Agallocha*) is a fig-like tree common in mangrove formations. The milky sap if it gets into the eyes causes temporary blindness and intense pain. Children in Queensland sometimes use the sap of the Moreton Bay fig and other figs as a chewing gum. They have used the sap of Milky Mangrove in mistake once or twice with fatal results.



Good and Bad Practice in Milking.

L. VERNEY, Dairy Instructor.

MEASURED in terms of people employed capital invested, and value received, dairying is one of our greatest land industries. There is no substitute for milk, for young and old alike it is the perfect food, containing all the elements required in order to sustain life. These facts alone make it obvious to every producer that the rules of strict cleanliness should be observed in milk production.

The principal factors which determine the quality of milk are its food value, cleanliness, and keeping properties, all of which are within the scope of the daily practice of any dairyman.

Those whose duties bring them in close association with the daily routine of dairy farms have exceptional opportunities for observing various methods of milking and also the attitude of the milker towards his cows.

Women, generally, are better milkers than men, because, probably, of their gentler nature. Many milkers apparently ignore the fact that in the process of milking a cow, good judgment, skill, and, above all, a kindly attitude are needed if the best results are expected. The cow, more especially the high-producing animal, is "a bundle of nerves" and her balance is very easily upset.

Cleanliness Essential.

Milk cleanliness is not always appreciated by some producers. While dirt may not necessarily impair the healthfulness of milk, it does impair its keeping quality because of the bacteria introduced with it. It is common knowledge that most of the dirt found in milk is introduced at the time of milking, yet how many dairymen brush their cows to remove any loose hairs and dirt which may float into the bucket? This brushing or grooming should not be regarded as just another job to be dodged, but as an essential in the daily routine of dairy practice.

The washing of the flanks, udders, and tails before milking is neglected too often. After all, it takes up very little of the milker's time and one is amply repaid for the little extra work involved.

"Wet" Milking Condemned.

A general practice is the wetting of the hands with milk, and it is one that is strongly condemned as a filthy habit. "Wet" milking is a very prolific cause of high bacterial count in milk samples taken for the determination of keeping quality and purity. Some dairy farmers excuse the practice of "wet" milking by stating that the calf is a wet milker; the calf is a wet milker from the fact that it has no other choice of systems, and it is well for those having that idea to keep in mind the fact that the calf is not producing milk for human consumption. Any dairyman who changes his system of milking from "wet" to "dry" will have no cause to worry about a high bacterial count.

Milking Should be Efficient, not Perfunctory.

On some dairy farms, milking is done rather perfunctorily, and quality suffers in consequence. After the milk has been drawn, unless it is carefully strained, the results may nullify any precaution taken at the time of milking. Some use defective strainers and many none at all. Proper straining will remove all the visible dirt, but no strainer is fine enough to hold back the bacteria. The idea that straining will remove any defect in the milk due to carelessness at the time of milking is quite unsound.

Danger lurks not in the visible dirt but in the invisible dirt. It should be borne in mind that any strainer will become a serious source of contamination if it is not kept sterilized.

As odours are most readily absorbed during the time of milking, smoking should not be permitted on the dairy premises during milking operations. The clothes worn by those taking part in the work of dairying should be clean and not milk-grimed or greased. In any case, the wearing of dirty clothing while milking is quite inexcusable.

In all branches of milk production, let the slogan be—

A clean milker with clean hands, clean cows, and clean dairy utensils.

DAIRY CATTLE BREEDING.

A dairy farmer may not hope for great success unless his herd has a foundation of good blood. The widespread use of inferior sires has been for years the primary cause of low production figures per cow, and of needlessly poor quality. Obviously the continuance of such conditions is both uneconomic and unnecessary, and the most direct and practical means of herd improvement is to use sires of true representative type of a particular breed, and which are backed up by yearly records of their ancestors.

Breeding establishes no new traits or characteristics. It simply selects and concentrates them. Good breeding eliminates the low producing characteristics of an animal.

Animal breeding is an art as well as a science, and not every breeder of pure-bred cattle is a genius at it. In other words, to be successful, a breeder should possess certain natural gifts, and, above all, he should be a student and a very alert one at that. It is only in comparatively recent times that we have begun to acquire accurate knowledge of the operation of some of the laws that govern the breeding of animals. It was through the patient, untiring work of an Austrian monk, Abbot Mendel, who laid down the law of definite breeding in plants, that we to-day are able to work on similar lines in cattle breeding. Since Mendel's day the science of genetics has made very rapid progress, and evidence of the true behaviour of animal characters is beginning to accumulate. It is a fundamental rule in breeding dairy cattle that "like begets like," but in the union of opposites we get "throw backs."

The dairy cow of to-day is largely an "artificial" product. She has attained her high production capacity through scientific feeding and breeding. We live in an age of specialisation, and, if dairymen would specialise more along the lines of breeding and feeding far better results would be obtained.

—L. VERNEY.

Reasons for Keeping Milk Records.

L. VERNEY, Dairy Instructor.

FOLLOWING are some convincing reasons, universal in their application, for keeping records of dairy cows and which are of first importance to everyone who milks cows for a living.

(1) Milking records constitute a guide for the feeding of each cow according to the quantity of milk she produces. Records stimulate better feeding and breeding. The dairy farmer who keeps records usually feeds a balanced ration and becomes interested in winter feeding, and so maintaining his milk supply throughout the year.

(2) The weighing of the feed and milk keeps the dairyman in close touch with the daily condition of each cow; ill-health is thus readily observed.

(3) Milking records form the only basis on which a herd can be improved.

(4) No careful dairy farmer will buy a bull for use in his herd whose dam has not an authentic record, showing creditable milk and butter-fat production.

(5) Records alone will sell cows when no other quality will. Grade cows with records can be sold from 25 to 50 per cent. more than those for which there are no milking records.

(6) A system of records is the first step in building up a herd. Unprofitable cows are the most expensive; their heifer calves are usually low producers and should not be kept for the milking herd.

(7) Records also stimulate better milking. Milk scales serve as a check on the milker and induce him to milk more thoroughly than when the milk is not weighed. A knowledge of what each individual cow is doing develops personal pride and interest in the herd.

(8) Finally, records make dairying a business proposition and, in various incidental ways, mean more money to anyone who milks cows for a living. A maxim which should be prominently displayed in every milking shed is—

The cow, not the herd, is the unit of profit.

Herd Testing and Culling.

C. R. TUMMON, Dairy Inspector, Malanda.

HERD testing, if done thoroughly and systematically, is one of the best means of ascertaining which are the highest producing cows in the herd, thus indicating to the farmer the cows which should be retained and the cows which should be culled. A good bull, with a background of high production, should head every herd.

A short period of herd testing is of no value whatever. To get the maximum results, testing should be continued over a term of years. Culling should not necessarily be associated with the testing. The extent to which culling out the lowest producers of butterfat should be practised depends largely, of course, on the size of the herd, and also on the extent to which the farmer can afford to dispose of his

cows. However, where culling can be practised extensively after the first year's testing, the quickest possible results will be attained. The farmer should endeavour to set his own standard for butterfat production per cow, and any cows failing to reach this standard by the end of the lactation period should be fattened immediately for the butcher. Culled cows should never be sold to another farmer for dairying; otherwise the ultimate object of herd testing—the raising of the average production per cow for the whole State—will be defeated.

Farmers may either test their own herds, or avail themselves of the free herd testing service provided by the Department of Agriculture and Stock. If a farmer decides to do his own testing, full details of the Babcock test, together with information covering the estimation of butterfat for the lactation period, are obtainable free of charge from the Department.

However, with the free herd testing service, very little effort is required of the farmer. Milk sample bottles containing preservative, together with instructions for sampling, are sent to the farmer about a week before the test is due. The freight both ways on the bottles is borne by the Department. The farmer has to record the names of his cows on the chart provided, together with date of calving. He then has to weigh the amount of milk received from each cow during a forty-eight-hour period, record the weight opposite each cow's name, and take a composite sample of each cow's milk, which is placed in the bottles, numbered correspondingly and returned to the departmental officer for testing.

No fewer than five tests should be made during the 273 days lactation period, in order to gain a reasonably accurate estimate of the butterfat produced during that period.

In very many cases, the lowest producing animals are the most intractable to handle, the most difficult to milk, and consume the most feed; so it is obviously to the farmer's advantage to be able to rid the herd of the culls from the point of view of less work with greater efficiency and consequent economy in feeding.

The saving in time alone, because of having to milk fewer cows for the same return, is a substantial factor in successful dairying.

MEASURING FOODSTUFFS.

Measuring foodstuffs by handfuls is wasteful and unsatisfactory. Use this table:—

- 1 bushel = 8 gallons = 32 quarts.
- 1 kerosene tin (4 gallons) = half a bushel.
- A box 4 in. by 4 in. by 4 in. = 1 quart.
- A box 6 in. by 6 in. by 8 in. = 1 gallon.
- A box 12 in. by 12 in. by 15½ in. = 1 bushel.

(Inside measurements are followed.)

A quart tin filled, but not packed, would represent one thirty-second part of a bushel and would work out as follows:—

				Lb. oz.					Lb. oz.
Wheat	..	..	..	1 14	Peas	..	..	..	1 14
Maize	..	..	..	1 12	Barley	..	..	..	1 6
Oats	..	..	..	1 4	Salt (common)	..	..	..	2 0
Bran	..	..	..	0 10	Pollard	..	..	..	0 10
Wheat Meal	..	..	..	1 8	Meat Meal	..	..	..	1 8

The PIG FARM

Selection of Breeding Stock.

E. J. SHELTON.

THE purpose behind selection of good breeding stock, provision of good accommodation, and correct management is to increase numbers and reduce costs of production. The greatest losses occur between the farrowing and the weaning of a litter, hence the necessity for paying due attention to all sows with litters. Careful management will control most losses by removing the causes as far as possible before farrowing.

Now, more than ever, economy of production is essential, not only to the individual but to the nation generally.

In selecting breeding stock the first rule to observe is to make sure that the animals come from a dependable herd of clean, healthy stock. To be classed as clean and healthy, the herd should have been submitted to the agglutination test for porcine abortion with negative results and it should have a clean after-slaughter record. Similarly, freedom from other infectious and contagious diseases besides brucellosis and tuberculosis is important; and it is just as necessary that the young pigs, in particular, are free from intestinal worms, kidney worms, and other internal parasites, and also external parasites.

It is unwise to proceed with selection of the foundation stock until an ample supply of food is assured and until provision has been made for conservation of fodder in the form of grain and root crops for grazing and for a supply of both carbohydrate and protein-rich bulk foods or concentrates (meat meal, linseed meal, and other substances). Before the stock arrive, ample provision should have been made for their accommodation on the farm, for once purchased they become the absolute property of the purchaser and vendors usually expect to be relieved of responsibility as soon as the deal has been completed.

Prior thought should also have been given, of course, to the class of pig it is desired to produce; present day demand is for medium to heavy-weight baconers in preference to all other classes as being suitable for bacon or canning. These heavyweight animals have to be in the fleshiest of condition when sold or consigned, for there is no really dependable market for pigs carrying too much fat. Admittedly, wartime shortages of meat may seem to suggest that any old pig is good enough to realise top prices, while at auction sales it may seem to be that the fatter the pig the better the price. These are, however, only passing phases of the pig industry, and it would be unwise to depend on the overfat pig realising top prices as a regular happening.

What a Pig Should Be.

In the breeding of pigs it was at one time decreed wise procedure where the sows were of a long, rangy type to select a boar of short, compact stature so that there would be, as was then believed, a good admixture of types in the finished product. That advice is not now applicable, for the constant demand is for more and more lean meat with a minimum of firm, white fat, well intermingled (called marbling) through the lean tissues. In consequence, both boar and sow should be strictly of bacon type, lengthy, fleshy, with light forequarters and head, well developed back and loin, with compact, full, fleshy hindquarters.

Fortunately, these long, lean-type animals are usually more potent and prolific than short, squat types; and they have the advantage that they grow rapidly and mature at an early age. Both male and female should have a sound constitution, be strongly built, have strong, straight legs, and they should carry themselves in a way that indicates vigour and healthy development—the male being definitely masculine the female relatively feminine, docile, and evenly tempered.

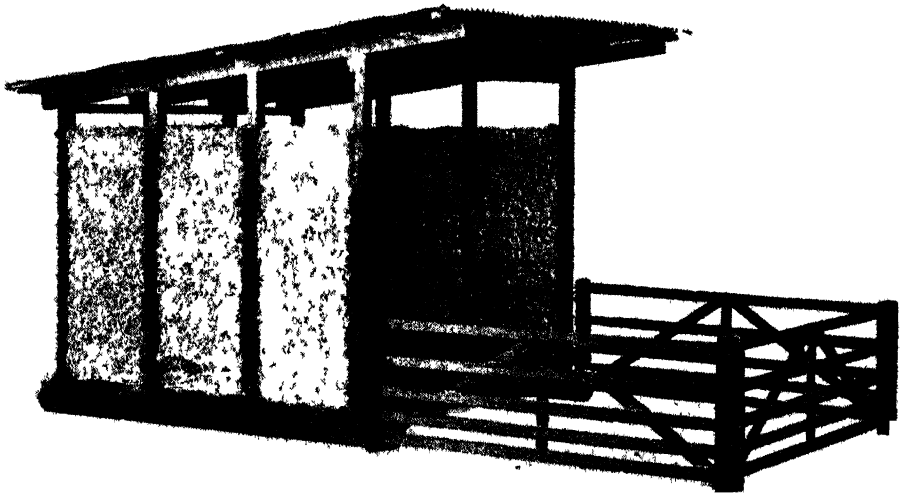


Plate 19.

COMFORTABLE PIG ACCOMMODATION ON THE FARM.—It is useless buying good quality breeding stock unless provision is made for comfortable and healthy quarters on the farm.

Age to Mate.

Boar and sow should not be allowed to mate until they are well grown, usually after they are nine months of age. There is no reason why, if well cared for, these animals should not prove satisfactory breeders up to the age of six or even seven years, but there should be a very strict system of culling any animal immediately unless they come up to the desired standard. There is no shortage of good quality young breeding stock and prices invariably are most reasonable, although higher now than when bacon pigs were worth only around 4d. to 5d. per lb. dressed weight.

Transport of Breeders.

The transport by rail of pedigreed and other pigs for breeding purposes is arranged most conveniently by placing the animals in properly constructed crates and sending them by express goods or other trains giving rapid transport to their destination.

Sales of breeding stock are usually arranged on the basis of delivery in crate at sender's station and subject to return of crate to the same station, freight paid (if any), by purchaser and as early as convenient after delivery. Forward freight on such consignments in Queensland is subject to a rail rebate of 20 per cent. (on pedigreed as well as non-pedigreed animals), an amount which should be deducted from the freight total when it is being paid either by consignor or consignee. This rebate, however, is subject to the railway waybill being endorsed: "For breeding purposes."



Plate 20.

A SUITABLE TYPE OF CRATE FOR TRANSPORT OF STUD PIGS.—Note that although this crate has been used principally for weighing pigs on the farm, it is of a type adapted for both purposes, the wires being attached when crate is used for weighing.

Care should be taken always to see that the crates are sufficiently large to allow the pigs reasonable freedom of movement, that a trough for food and water is provided, and that movable doors are fitted at each end.

It is usually better to use sieved sawdust as bedding in pig crates instead of straw or grass. If pigs are consigned by rail for more than about 300 miles, arrangements should be made for an agent to feed and water the animals en route; the expense incurred should be part of the original quotation or a condition of the transaction.

Wherever possible, the despatch of stud pigs in crates should be so arranged that the animals will not have to travel during very hot weather, especially over long distances. It should be specially noted, too, that consignments of stud pigs in crates will *not* be accepted for transport by passenger or mail trains.

In all such transactions three parties are principally concerned—the consignor (that is, the sender or vendor), the consignee (the person receiving), and the Railway Department or other transport authorities.

So far as the Railway Department is concerned, provision is made covering the transport of the live animals at scheduled rates, but there are no special regulations relating to the carriage of returned empty pig crates, although they are given the same attention as other classes of goods.

The consignor is the one principally inconvenienced where there is delay in returning empty pig crates, for it is not usual for stud pig breeders to carry a stock of crates, only those actually required being available.

The Railway Department, of course, also becomes involved where there is delay in return of empty crates. In a recent report the Secretary to the Commissioner for Railways, Brisbane, had this to say, *inter alia*, in discussing the condition of crates as received and some of the hindrances to rapid return:—

Crates.—No doubt these are made as light as possible to minimise freight; consequently, after a period in use they become insecure and liable to damage by the pigs. The boards so often reported as missing are probably removed by the person receiving the pig to release the animal from crate and are not replaced on the crates when being returned.

Delay in Transit.—Consignees (unfortunately) invariably use the original consignor's label as a return address, after alteration, and the labels falling off thus lead to the crate being separated from the book entry and resulting in its being held (by the railways) until placed through official correspondence.

As an illustration, the Secretary to the Commissioner indicated that the General Manager at Rockhampton had occasion to report to the General Manager at Brisbane that three pig crates addressed to a well-known stud piggery on the main line had been lying on the platform at an isolated siding for a considerable time. These crates had apparently been dumped on the platform without the farmer taking the trouble to consign them—that is, making out a consignment note and informing the station-master accordingly.

The farmer apparently was under the impression that empty pig crates are dealt with in the same way as empty cream cans; but this is not so, because crates must be consigned as goods, and unless so consigned their return may be unduly delayed.

Stud pig breeders and others concerned should note, therefore, that before empty pig crates are accepted by the railway authorities for return to the original sender's station they must be consigned in the ordinary way, and where freight is payable—as it is in the case of crates carried over long distances—freight must be prepaid by the

person consigning, or finally by the person receiving the crate, if sender's station is not one at which there is an officer in attendance.

It is a good practice to advise the consignee by letter when empty crates are being returned so that he shall not have to make unnecessary visits to the station in search of the crates.

The Railway Department cannot, obviously, be held responsible if senders neglect to consign, or consign crates with boards missing or otherwise damaged, or without correct address labels firmly affixed to the crate.

It is wise to book space beforehand where crates are being forwarded, either with the live pigs on the forward journey or when empty crates are being returned.

Particulars regarding the size of crates, materials used, and any other information on the subject may be obtained from the Department of Agriculture and Stock, Brisbane.

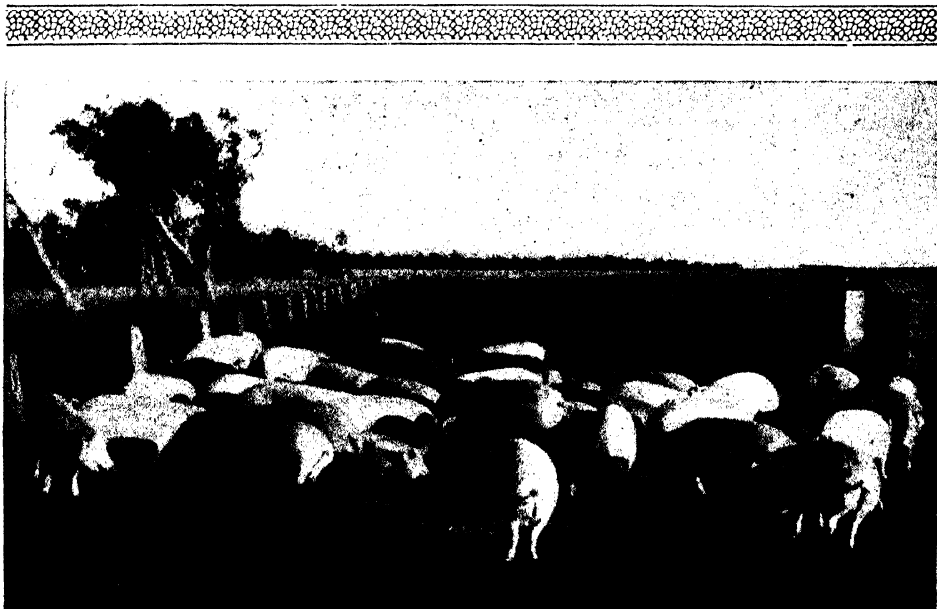


Plate 21.

THE PADDOCK OR GRAZING SYSTEM PERMITS OF THE ECONOMICAL USE OF AREAS SUITABLE FOR GRASS AND FODDER CROPS.—The paddock system also calls for less labour.

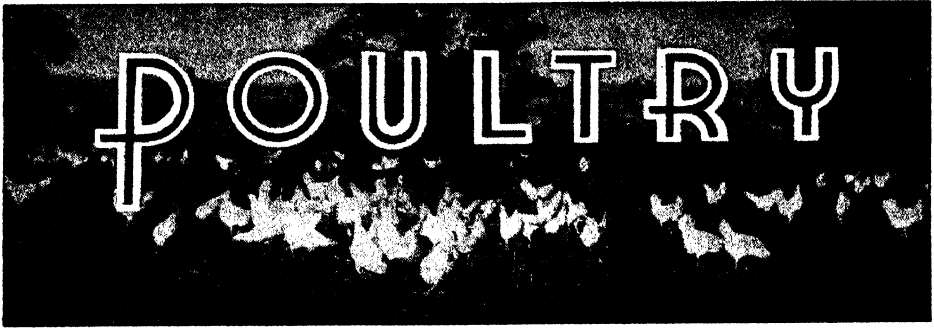
THE COUNTRYMAN'S SESSION

Sunday Morning Radio Service to Farmers

(By arrangement with the Australian Broadcasting Commission)

Farmers are recommended to tune in to either a
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EVERY SUNDAY AT 8.30 a.m.



Care of the Laying Hen.

P. RUMBALL.

AS the chief source of profit on the ordinary commercial poultry farm, pullets require very careful management. They are easily upset, and even a slight alteration in procedure may stop them from laying. Therefore, any proposed change in feeding or management should be made before the birds commence to lay.

Pullets should be so fed as to ensure their continuous growth. If given dry mash they should have ample feeding room—one foot of feeding space to ten birds is recommended. Plenty of mash should be always available to them. Any shortage will retard growth, or, if they are laying, cause a cessation of egg production. Should the wet mash feeding system be adopted, it is advisable to give one full meal of mash early in the morning, followed by a smaller meal at midday. These meals should be fed at about the same hour every day.

In feeding grown birds, the general practice is to supply only the morning meal of mash; and, if it is desired to adopt this practice for the pullets when they are full-grown, it is essential that the mid-day meal of mash be discontinued before they commence laying. Chaffed green-feed or soaked lucerne chaff could be fed at midday to replace the meal of mash.

Growing mash is usually fed until the pullets are about four months old, and then a change made to laying mash. Making a change at this age has the advantage of not affecting the birds. Should the change be left until the pullets have commenced laying, it is essential that the process be gradual, and at least one week taken to complete the process.

As a general rule, the evening meal should consist of grain—wheat or maize, or a mixture of both. If it is desired to make a change in the grain ration, this should be done prior to the start of production; or, if later, this change should also be a gradual process.

Pullets being reared in colony houses or temporary quarters should be moved to the permanent houses before they commence laying. Should this be delayed until after they have commenced laying, there would probably be a general "strike." The number in each unit is an important factor. Pullets will make more uniform growth and production will be highest when kept in relatively small groups. Groups of more than 100 are undesirable.

In no circumstances should pullets be overcrowded. One of the most common faults in poultry management is that a large number of pullets are reared without making the necessary provision for their accommodation.

Most poultry-raisers have a general knowledge of the principles and practice of feeding, and take into consideration factors that make for efficient and economic production.

Present-day values of cereals may induce some to depart from old and accepted practices in order to reduce costs. There are three points, however, that should not be lost sight of if the best results are to be obtained and the general health of the stock maintained—viz., the vitamin content of the ration, the protein content, and the quantity supplied.

Vitamins.—Vitamin A is of outstanding importance at the present time, for a shortage in the ration may cause outbreaks of nutritional rump as well as lowered egg production. The feeding of yellow maize and green feed ensures a sufficient supply of this vitamin. The price of maize will, however, preclude its inclusion in the ration to the same extent as in past years. Wheat will be used to replace this cereal, and so one source of vitamin A is lost.

On most poultry farms during the winter months green feed is not plentiful; consequently, in normal circumstances the loss due to a shortage of maize cannot be overcome. It is, therefore, of paramount importance that the poultry-raiser should make a special effort to supply the birds with good, succulent green feed. Green feed is the cheapest form in which the birds' requirements of this vitamin can be supplied. In cases where home-grown feed cannot be obtained, poultry-raisers should use at least 10 per cent. of good green lucerne chaff or meal in the mash fed to their birds.

Protein.—To obtain the maximum economic production, laying birds should have in their ration (i.e., grain and mash) a total of approximately 15 per cent. of crude protein. Maize has about 10 per cent. and wheat about 13 per cent. of protein. Where maize has been used extensively and is replaced with wheat, it may be desirable to reduce slightly the protein content of the ration. This is most easily brought about by a slight reduction in the meat meal fed.

Skim Milk a Protein Rich Food.—Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding, and to give their fowls the necessary amount of protein use one or other of the prepared mashes. These mashes are usually fed with grain, the birds being given an equal quantity of each. In these circumstances, a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may, therefore, depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied, and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk, mash, and grain are being fed to the flock, to give the birds all the grain that they will consume, and not force them to eat given quantities of mash. This policy will largely enable the birds to balance their own ration.

Quantity.—Providing the right kind of food is being used, economic production is only possible by feeding the birds all they will consume. Do not be afraid of making your birds unduly fat. The good producer will convert the food supplied in excess of body requirements into eggs. Birds which cannot do this should be culled and sold for table purposes.

Water.—Irregular supplies of water will retard growth or affect production to a greater degree than any other factor. Therefore, a strict watch should be kept to see that the pullets have a constant supply of clean, fresh water, and that it is situated in a cool, shaded place.

MARKETING TABLE POULTRY.

To obtain the highest returns, it is obviously necessary to market poultry for table purposes in the best possible condition. The term condition may be taken to mean the state of the feather, flesh, and age of the bird. If culling of the layers receives the attention that it should, little can be done by the poultry raiser to improve the returns that he will receive from culled hens.

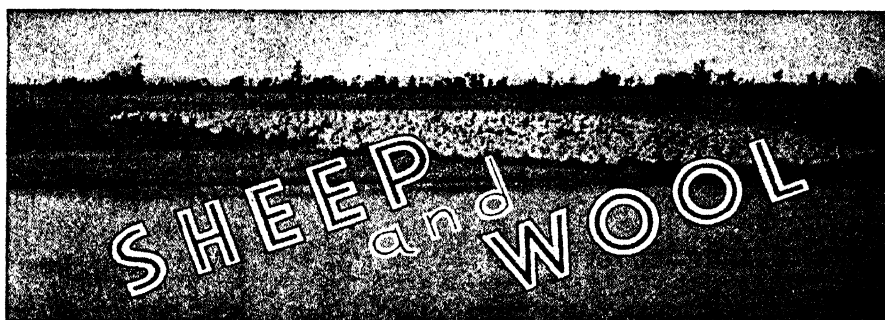
Experiments have indicated that the flesh carried by a well-fed hen at the end of her period of egg production cannot be increased economically by a system of feeding, and that the hen that has lost weight because of regular egg production takes too long to respond to a course of feeding. The best practice, therefore, is to market culled hens before they become a mass of pin feathers. This condition applies particularly at this time of the year.

Just now, the correct marketing of cockerels is of particular importance. This class of fowl sells reasonably well at any stage of development, if the bird is sold before it reaches what is known as the "staggy" stage. This term is applied to birds commencing to show spur development. In order to obtain the maximum value for cockerels for table purposes, they must be sold while the spur is still in the bud stage. Many breeders keep cockerels until this stage has passed, and, consequently, do not get top prices.

In the marketing of cockerels, it is well to examine the feather growth. Cockerels with a lot of pin feathers do not dress attractively. This applies particularly to birds such as the Australorp, because of the colour of the plumage. Pin feathers on white feathered birds are not so noticeable.

Again, certain breeds are not well-fleshed at all times. This applies generally to the bigger birds—such as the Light Sussex and the Rhode Island Red.

To summarise—poultry raisers with cockerels to market should, firstly, bear in mind the fact that birds with indications of spur development do not realise the maximum value; secondly, that the rate of development of cockerels from twenty to twenty-four weeks of age is not as great as that which takes place earlier; consequently any increase in body weight is at a greater cost; and thirdly, that it is undesirable to market cockerels carrying a lot of pin feathers, and those that are scraggy and not well fleshed.



Wool Classing—A Comparison.

J. L. HODGE, Instructor in Sheep and Wool.

SUBJOINED is the estimated wool clip from 10,000 merino sheep, classed properly. Although the prices shown are rather lower than present-day appraisements, they may be regarded as a fair approximation. For purposes of this estimate, sexes of the sheep have been ignored and lambs excluded, and its object is to provide a comparison of market values in respect of a well-classed clip and a clip classed less carefully.

In interpreting these tables, it should be remembered that the fleeces are free, that the clip is a good one and would average over the price obtained per lb. for the whole appraisement. It totals 250 bales, made up of 166 $\frac{2}{3}$ fleece wool, 25 broken, 24 $\frac{1}{3}$ pieces, 10 bellies, 12 stains, and 12 locks—classed as follows:—

Class.	Number of Bales.	Price per lb.	Nearest £. Value per Bale.	Total.
		<i>d.</i>	£ <i>s.</i> <i>d.</i>	£ <i>s.</i> <i>d.</i>
AAA W (or E)	31	14 $\frac{1}{2}$	18 2 6	561 17 6
AA W (or E)	46 $\frac{2}{3}$	13	16 5 0	758 6 8
A W (or E)	29	11 $\frac{1}{2}$	14 7 6	414 17 6
AAA Combing W (or E)	33	13 $\frac{1}{2}$	16 12 6	548 2 6
AA Combing W (or E)	27	12	15 0 0	405 0 0
Broken W (or E)	25	12 $\frac{1}{2}$	15 12 6	380 12 6
Pieces W (or E)	24 $\frac{1}{3}$	10 $\frac{1}{2}$	13 2 6	319 8 4
Bellies W (or E)	10	9	11 5 0	112 10 0
Stains W (or E)	12	6	7 10 0	90 0 0
Locks W (or E)	12	3 $\frac{1}{2}$	4 7 6	52 10 0
	250	..	..	£3,643 5 0

Estimate of a clip from 10,000 sheep (merino) classed indifferently at approximately present-day prices.

Class.	Number of Bales.	Price per lb.	Value per Bale.	Total.
		<i>d.</i>	£ <i>s.</i> <i>d.</i>	£ <i>s.</i> <i>d.</i>
AAA W (or E)	64	13 $\frac{1}{2}$	16 12 6	1,064 0 0
AA W (or E)	73 $\frac{2}{3}$	12	15 0 0	1,100 0 0
A W (or E)	34	10 $\frac{1}{2}$	13 2 6	446 5 0
Broken W (or E)	20	11	13 15 0	275 0 0
Pieces W (or E)	20	9 $\frac{1}{2}$	11 17 6	237 10 0
Bellies W (or E)	11	7	8 15 0	96 5 0
Stains W (or E)	13 $\frac{1}{3}$	6	7 10 0	100 0 0
Locks W (or E)	14	3 $\frac{1}{2}$	4 7 6	61 5 0
	250	..	..	£3,380 5 0

Note.—AAA combing W (or E) and AA combing W (or E) is strong wool which in the first place was taken out as shown. Here it is left in AAA W and AA W (or E), thereby depreciating the prices to the levels they brought when taken out.

A W badly skirted therefore goes up 5 bales in number, but loses 1d. per lb.

Broken has been picked badly and loses both in number of bales and price per lb.

Pieces treated carelessly, some wool going to stains to the loss of pieces, but no gain to stains.

Bellies unskirted or done badly, lose 1d. per lb.

Stains gain at the expense of pieces (a more valuable wool) in weight, but not in price.

Locks become heavier as the result of carelessness and want of supervision on the part of the classer, but the price received is no greater, thus losing the difference between stain prices and locks for every pound gained in weight.

—	Bales.	Lb.	Value.		Difference.	
			£	s. d.	£	s. d.
Clip—well classed	250	75,000	3,643	5 0	263	0 0
Clip—classed indifferently ..	250	75,000	3,380	5 0	..	..

Price per lb. No. 1 clip, 11-6d.

Price per lb. No. 2 clip, 10-8d.

I have thought it well for purposes of illustration to take a well-classed clip as against one classed with less care.

The figures work out well for the purpose for which they are intended. For instance, it would be quite easy to reduce the amounts obtained for clip No. 2 to almost any figure in reason, but here I have shown distinctly the loss entailed in a clip classed, but done indifferently, in comparison with the same clip handled properly.

I might mention that I have been more than fair in the figures quoted to the indifferently classed clip.

FENCING POSTS.

Distance Apart.	Number of Posts.	
	Per Chain.	Per Mile.
6 feet	11-0	880
8 feet	8-25	660
9 feet	7-34	587
10 feet	6-6	528
12 feet	5-5	440
14 feet	4-7 1/2	377
15 feet	4-4	352
16 feet	4-1 1/2	330
18 feet	3-6 7/5	293
20 feet	3-3	264
33 feet	2-0	160

ANIMAL HEALTH

The Supplementary Feeding of Sheep in the Central West.

G. R. MOULE.

IN many parts of the Central West it has become the practice to feed mineral supplements to sheep when they are forced to graze on dry coarse feed of low nutritive value.

As proprietary lines are not available, the following article has been prepared for the guidance of graziers who desire to feed supplements.

The Necessity for Supplementary Feeding.

As the Central West is situated in our summer rainfall area, the normal seasonal expectancy is a flush of feed during the warmer months. If the winter is wet the "herbage" plants carry the sheep along until the spring storms and the wool grower feels justified in stating he has had a good season.

Winter rains only occur, however, on the average, one year in every five. In very cold winters, and particularly if a few ineffective showers of rain fall, the pasture quickly deteriorates in quality, and the sheep soon show the effects. Although general drought conditions do not exist, the sheep experience a temporary "protein drought," and accordingly, if supplementary feeding is to be undertaken, it should aim at overcoming this protein deficiency.

Observations made on young sheep on both "Downs" and "Desert" country have indicated that under the present dry conditions sheep may suffer a calcium shortage, and this is further borne out by the analysis of dry Mitchell grass.

Calcium is necessary for young sheep in developing good bones and teeth. It is an important constituent of milk, and consequently supplies of calcium should be included in any supplement fed to lambing ewes or young sheep.

Is Salt Necessary?

Salt is helpful in a supplement for controlling the amount of supplement eaten. It is also useful in starting the sheep on the supplement. There is no conclusive proof that a supplement of salt alone is helpful or necessary to sheep, especially those on saline bore water, and as it is in short supply it has been curtailed severely for feeding to sheep.

A Suitable Supplementary.

A supplement that will assist sheep on dry feed can be made by mixing the following ingredients:—

Salt—30 parts (by weight).

Ground limestone—35 parts.

Protein rich meal (meat meal, cotton seed meal, linseed meal, &c.)—35 parts.

The whole can be bound with well diluted molasses and allow 1 oz. per head per day for young sheep and 2 oz. per head per day for lambing ewes, or a little over $\frac{1}{4}$ ton and $1\frac{1}{2}$ tons respectively per thousand per month.

Control of the amount sheep eat is often difficult. Probably the best way is to incorporate about 10 per cent. of gidyea ashes (rich in lime) in the supplement. As the sheep get more accustomed to the supplement it may be possible to reduce the amount of salt and increase the amount of ashes.

Is Supplementary Feeding Worth While?

This is a question graziers must answer for themselves. The above supplement will cost a little over £10 per ton to make up, and 3 tons would last 2,000 sheep about 2 months at 1 oz. per head per day. This, of course, is cheap agistment, but when larger flocks have to be handled the labour of mixing and distributing the supplements becomes quite a factor to consider.

On the other hand, rainfall figures show that about 60 per cent. of all Augusts, Septembers, and Octobers are well below average for most places in the Central West, and accordingly if graziers decide it is necessary to feed a supplement they should be prepared to do so for a period of probably two or three months.

Fluorine Poisoning of Live Stock.

G. R. MOULE.

RECENT surveys have indicated that the element fluorine, which can be poisonous to live stock, is causing a considerable amount of trouble amongst sheep in certain parts of Queensland. Therefore, this short note on fluorine poisoning of live stock has been written for the information of stock owners.

Fluorine has been detected in certain artesian and sub-artesian waters in the Central-Western district. Sheep, cattle, or horses drinking this water may show symptoms of fluorine poisoning.

The Effect of Fluorine on the Animal Body.

The toxic effects of the element can be recognised easily. Actually it is found that fluorine is strongly attracted to the calcium (lime) in the bones and the teeth, and these organs are most commonly affected when poisoning occurs.

The bones lose their normal colour and "sheen" and become thickened and softened, and they break easily. Sometimes bony out-growths, usually referred to as exostoses, can be detected on the surface of the long or flat bones, e.g., the bones of the leg or the lower jaw.

If the animal becomes affected during the growing stage of the teeth, a peculiar mottling of the enamel occurs. Naturally this can be observed most readily on the incisor (front teeth) of animals. If the molars (grinding teeth) are examined they will be found to be worn very unevenly. The careful observer will also notice that the permanent teeth do not come through at quite the right time.

If older mature animals are subjected to a large daily fluorine intake they usually waste away and eventually die, and there is very little that can be seen on post mortem.

Quantity of Fluorine Required to Poison Animals.

When the fluorine occurs in the water and the animals are subjected to a constant fluorine intake, very small quantities are required to set up poisoning. Cases have been recorded from Western Queensland where sheep have been poisoned on water containing 12 parts of fluorine per million. Actually there is evidence to show that regular intake of waters containing as low as 1 part/million can be harmful.

There are indications to suggest that the period of time over which the fluorine is consumed is of as great importance as the dose, that is to say, fluorine is a slow cumulative poison.

Animals Affected.

Sheep are the animals that seem to be most commonly affected in Queensland, probably because the fluorine waters occur mostly in the sheep country. However, cattle and horses drinking this water can also be affected.

Symptoms.

The main symptoms produced are:—

- (i.) Emaciation and decreased appetite.
- (ii.) Salt hunger.
- (iii.) Stiffness of the joints.
- (iv.) Abnormal teeth and bones.

The emaciation and decreased appetite are probably secondary to the abnormal teeth, which obviously cannot grind foodstuffs properly.

Treatment.

No curative treatment is known to be of value. If the animals are removed from the supply of fluorine, some degree of recovery results, though the damage to the teeth is permanent.

Prevention.

It is advisable to have water from bores and sub-bores analysed for fluorine content, and any poisonous waters can then be avoided.

It is important to note that intermittent fluorosis is not too harmful, and this gives owners of fluorised waters a chance of managing their properties more or less successfully by arranging switches at regular intervals from surface to bore water or from bore waters, proved by analysis to contain fluorine to bore waters proved to be safe.

FLIES IN EYES.

There are various ways of relieving a horse suffering with "fly strike." One is pennyroyal and olive oil in the proportion of 1 oz. to a pint. This and similar preparations are usually applied with a sponge, and are effective so long as they retain their strength. A real protection for horses against fly attack is the familiar leather veil or fly-beater attached to the headstall.

Agricultural Chemistry

Fire Risk with Nitrate of Soda.

F. B. COLEMAN.

STOREKEEPERS and farmers are warned against the risk of fire attendant on the storage of nitrate of soda, or empty nitrate of soda bags.

Where reasonable precautions are taken, the fire risk is considerably reduced and may be considered a normal one.

The nature of nitrate of soda is such that when a flame or spark—from any source including a lighted cigarette—comes in contact with bags to which nitrate of soda is adhering, or any organic material in contact with nitrate of soda, there is a real risk of a fierce fire.

Precautions to be taken to reduce the fire risk to a minimum are:—

Store nitrate of soda in an isolated building.

Do not allow smoking near nitrate of soda, or in any shed where it is stored.

All storage should be well removed from any fires, stoves, engines, motor and other vehicles. Matches should not be carried when handling nitrate of soda.

When applying nitrate of soda in the field, bags (either full or empty) should not be stacked near a field of standing cane.

Do not store empty nitrate of soda bags anywhere until they have been thoroughly washed in water changed frequently, then rinsed in clean water and dried at ordinary temperatures. The washing water will be very useful if applied to vegetables or cane or other crops; thus the trouble of washing bags will be repaid.

Shaking the bags after they have been turned is only effective if all the nitrate is removed thereby, and cannot be relied on to remove the fire risk. If the bags have been damp—and this can be caused from moisture in the air—the fibres absorb the nitrate, which can then only be removed by washing as before mentioned.

Nitrate of soda is by itself harmless, but as a provider of large quantities of oxygen, any combustible organic substance impregnated with it, or in contact with it, becomes highly inflammable, automatically renewing its supply of oxygen as it burns. Nitrate fires for that reason are difficult to subdue. They also start very easily and spread with great rapidity, especially when the weather is dry. A spark on a nitrate bag will not go out, but will result in the whole bag being consumed by fire in a very short time.

The best method of dealing with a fire in which nitrate of soda is involved is to—

Isolate if practicable, i.e., confine the fire to as small an area as possible by removing all surrounding inflammable material. Keep this in mind when storing nitrate.

Apply water in volume, but not as a high pressure jet.

Beware of scattering the material.

If nitrate is in a liquid condition, use sand or clean soil to prevent spread.

A chemical fire extinguisher, if one is available, is an effective means of controlling a small nitrate fire.

Finally, observe all precautions regarding storage and do not use unwashed nitrate bags as containers for any other substance.

It is always advisable to notify the insurance company who cover your fire insurance when it is intended to store nitrate of soda.

Even though an insurance protection against fire is obtainable, destroyed buildings and commodities are very difficult and costly to replace, and their destruction represents a serious loss to the nation at the present time.

Nitrate of soda or nitrate of potash is an active element in ordinary gunpowder, but harmless by itself. It is safe to use if those who handle it know its nature; and it is a good fertilizer.

Stock Poisoning by Nitrate of Soda.—As there is a possibility of stock poisoning by nitrate of soda, the material should be stored where animals cannot gain access to it. Stock should be prevented from feeding on lush growth immediately after the application of nitrate of soda.

WEED KILLING—THREE GOLDEN RULES.

Weeds reduce the productive capacity of farms to a much greater extent than many farmers realize. Some farmers and graziers make a practice of carrying a light hoe with them whenever they have occasion to cross a paddock, and it is surprising the number of weeds they remove in the course of a year, almost without conscious effort. Here are three golden rules which it would pay every man on the land to observe:

1. Examine all crop seed for impurities before sowing. If impurities are found, send a sample to the Department of Agriculture and Stock, with a request for advice on them.
2. Keep a look out for any strange plant which makes its appearance on the farm. The Department will give information as to whether any such plants are weeds or otherwise.
3. All strange plants which are either known weeds or likely to become weeds should be destroyed before their seeds ripen and drop to the soil.

Unless these elementary precautions are taken, the time, labour, and money spent on destroying the plants are wasted, as a fresh crop of weeds, larger than before, may appear in the following season.

GADGETS AND WRINKLES

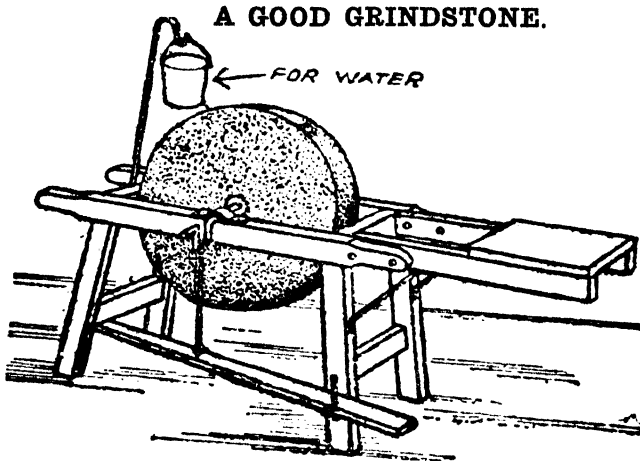


Plate 22.

A good grindstone is a valuable asset. If help is available to turn the handle, the stone can be merely fitted between two posts placed firmly in ground, and having shallow grooves cut out of top of each to serve as bearing surface for spindle. Where sharpening is mostly a one-man job an arrangement such as that illustrated is needed. Some foot treadles oblige the operator to stand on one foot and work treadle with the other. This is very tiring. Bolt two boards to grindstone frame, extend it 2 feet, and place a seat as shown. An uneven stone needs cutting down and toning up. Do this by grinding against end of piping, having stone dry.

If face of grindstone is hard and glazed, pour a little sand on stone every few minutes until glaze is worn off, and stone will cut like new. This condition is caused by exposing stone to weather. It is best to keep stone in shed under cover, but failing this, set it under a tree, and put a box over it when not in use. If bearings are stiff with hard grease, apply few drops kerosene and follow with some oil.

STRAINING WIRE NETTING.

This diagram illustrates a good method of stretching wire netting. Equipment consists of two lengths of 2 by 6 in. wood with two or three bolts passed through them so that they can be securely clamped to end of fencing as shown. A heavy rope is passed around both pieces, around a fence post and tied. A stout stick is used to twist rope, thus pulling fence as tight as desired. Device can be made in a short time from material found on every farm.

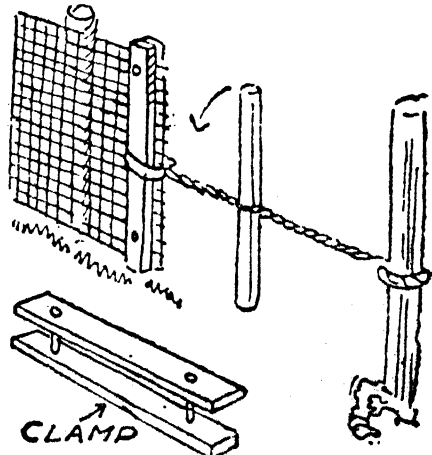


Plate 23.

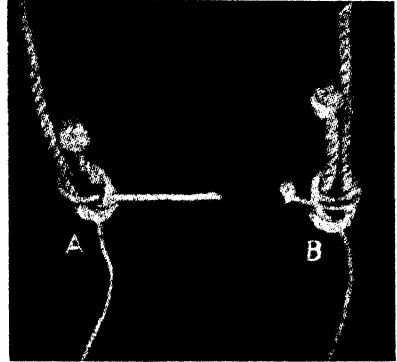
Knots to Know

SHEET BEND.

This knot (Plate 24) is adapted for joining two ropes of unequal size, but is safe only if the rope is kept tight. It can be made more secure by inserting an additional loop with the smaller rope. When used for small cordage where the ends to be joined are of equal size, the sheet bend makes a reliable and permanent knot.

Plate 24.

SHEET BEND: Fig A.—Sheet bend; Fig. B—Double sheet bend.



FISHERMAN'S KNOT.

This is one of the safest of all knots, and if properly made it cannot possibly slip. It should be noted that there is a wrong way and a right way of tying this knot (see Plates 25 and 26). The fisherman's knot can also be used for joining ropes of different sizes by making a hitch of each short end round the rope and pulling it tight. This, however, makes the knot much harder to untie, as the two hitches cannot now be slipped apart by simply pulling on the short ends.

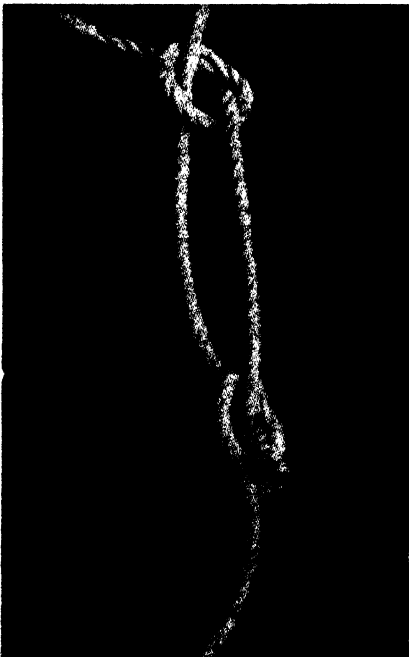


Plate 25.

FISHERMAN'S KNOT.—Wrong method.

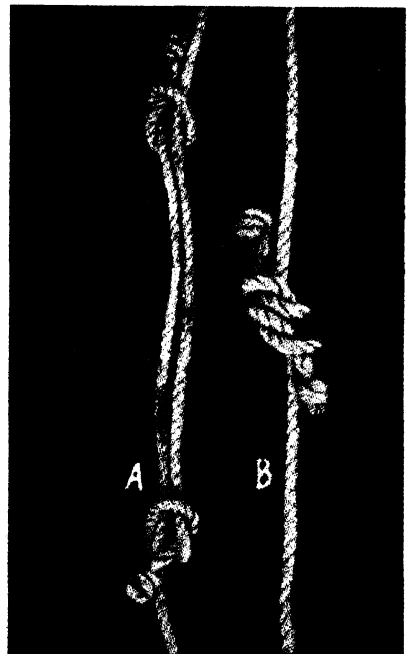


Plate 26.

FISHERMAN'S KNOT: Fig. A—In making; Fig. B—Pulled up.

CARRICK BEND.

This is the usual method adopted in connecting two large ropes, and has the advantage that it can be applied at any part of either rope. It is sometimes used when setting up a derrick mast for uniting bights in the middle of two ropes. The central loop is then passed over the mast and the four ends used as guy ropes (Plate 27).

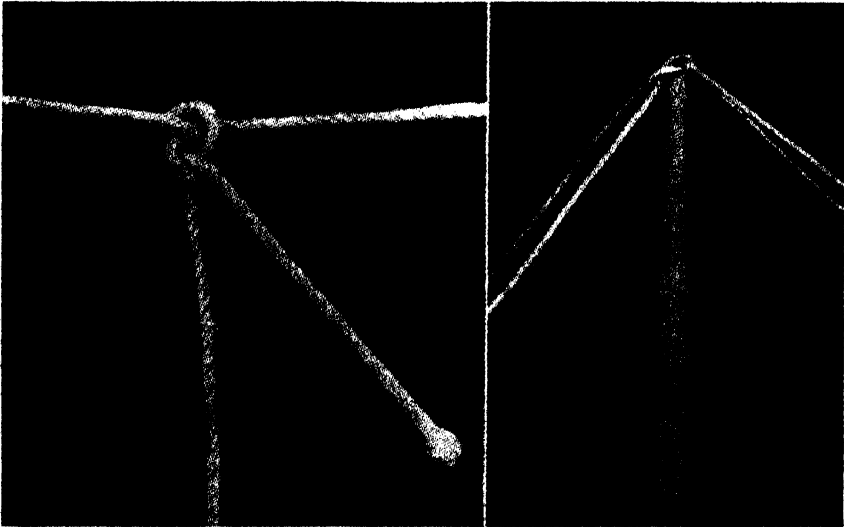


Plate 27.

LEFT—CARRICK BEND. RIGHT—THIS KNOT USED AS A GUY.

BOWLINE.

Where it is desired to make a running noose or a loop which will not slip or pull up tight, the bowline will be found a very useful knot. This knot is very simply made, it is easy to untie, and has a very wide range of application. It is one of the best knots for tying a horse as it cannot possibly tighten up and choke the animal. It is also a good knot for tying the reins to the bit rings, or for making a secure and non-slip hitch.

The knot is commenced by looping the rope as in Fig. A. Note that the loop must be made with the short end on top; and that the short end is led in from below, passed under the long end beyond the loop, and is then led up round this and passed down through the loop.

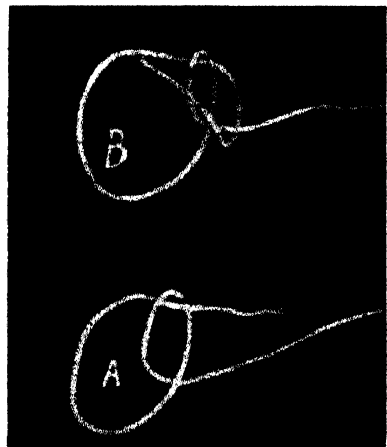


Plate 28.

BOWLINE: Fig. A—Method of tying; Fig. B—Completed knot.

In Memoriam.

HENRY TRYON.

THE death of Henry Tryon, formerly Government Entomologist, at Brisbane on 15th November, 1943, removed a notable figure from the scientific world.

The late Mr. Tryon was born at Buckfastleigh, South Devon, England, on 20th December, 1856. He was the son of Mr. Henry 'Curling Tryon, and a cousin of the late Vice-Admiral Sir George Tryon, K.C.B., and also of Lord Tryon, formerly Postmaster-General of the United Kingdom. After leaving school, he became a medical student at the London Hospital, one of his instructors being the celebrated Sir Ray Lancaster. Mr. Tryon, however, after a period, realised that he was not destined for the medical profession, and devoted himself to natural science, taking Linnaeus, the great Swedish naturalist, as his master, following in his footsteps, tramping alone all over Sweden, collecting plants, possessing confidence and self-reliance even as a young man. Later, he journeyed to New Zealand, managing a grazing property for his father. Finding this occupation uncongenial, he came to Australia, and devoted himself to entomological research, obtaining in 1883 an appointment at the Queensland Museum.



In 1894 the late Mr. Henry Tryon was appointed Government Entomologist, and in 1901 became also Vegetable Pathologist, holding the dual positions in the Department of Agriculture and Stock until his retirement, under the age limit, in 1929, having been in the Public Service for nearly fifty years.

As a scientist, Mr. Tryon had outstanding ability and distinction, one of his first works in the field of scientific research being a masterly survey of the insect pests and diseases affecting fruit and vegetables in the Toowoomba district. In his official report he described the Queensland fruit fly, this being the first record of this pest. Science was his only interest, but that interest covered a wide field in botany, entomology, geology, conchology, ethnology, astronomy, and Egyptology.

He had organising as well as scientific ability, was keenly interested in Departmental developments, and was on many committees of investigation into scientific problems.

Introduction of Badila Cane.

Among his most notable achievements from a departmental viewpoint was his introduction of Badila variety of sugar-cane. The importance of this was noted by the late Harry T. Easterby in his volume *The Queensland Sugar Industry*, from which the following reference is extracted:—"In August of 1895, Mr. Henry Tryon, Entomologist and Pathologist to the Department of Agriculture, was commissioned to proceed to New Guinea and collect a large number of sugar-cane varieties, which were to be sent to the State Nurseries of Kamerunga and Mackay in Queensland, and also to the Department of Agriculture in New South Wales. Mr. Tryon brought back sixty-six varieties, including the well-known "Badila," which is considered to be the best variety ever introduced into Queensland. The sugar industry undoubtedly owes a great debt of gratitude to the Department of Agriculture for this cane, to which the successful canegrowing in the North is largely attributable. Seeing that in many of these areas 95 per cent. of the cane grown is of this variety, it is not stretching the point to say that quite a number of growers owe their success as cane farmers to it."

Biological Control of Prickly-pear.

The prickly-pear problem was another important matter which engaged Mr. Tryon's close attention. In his book, *The Biological Control of Prickly-pear*, Mr. Alan P. Dodd makes the following reference to Mr. Tryon's association with this investigation:—"In 1912 the Queensland Government appointed a Travelling Commission, comprising Dr. T. Harvey Johnston, then occupying the Chair of Biology at the University of Queensland, and Mr. Henry Tryon, at that time Government Entomologist to the State, to investigate the avenues of control measures. The Commission spent eighteen months in visiting the many countries where prickly-pears were indigenous or had become acclimatised, and in its subsequent comprehensive and most valuable report made definite recommendations for the introduction under safeguards of certain insects and diseases from America. During its travels the Commission forwarded to Australia from Ceylon small stocks of the cochineals, *Dactylopius ceylonicus* and *D. greenii*; the former insect was successfully reared by Dr. Jean White-Haney at the Dulacca Experiment Station, was liberated in the field, and in the space of a few years almost completely destroyed the scattered areas of *Opuntia monacantha*. At this stage, it should be mentioned that among the prickly-pear insects encountered by the Travelling Commission was *Cactoblastis cactorum*, larvæ of which were found in the Botanic Gardens at La Plata, Argentine. Mr. Tryon actually brought some of the caterpillars alive to Brisbane, but failed to rear them through to the adult stage. Had this effort been successful, the control of prickly-pear may well have been brought about years earlier than has been the case."

Mr. Tryon was also a member of the Commonwealth Commission on cattle tick control. Very few scientists have equalled the late Mr. Tryon in the exceptionally wide scope of his work. His reputation as a scientist was not only appreciated in Queensland and other States, but was world-wide.

A complete list of his published works on economic zoology, entomology, botany, plant pathology, and veterinary science with particular reference to animal parasitology, containing 136 titles, was published in this Journal for August, 1929.

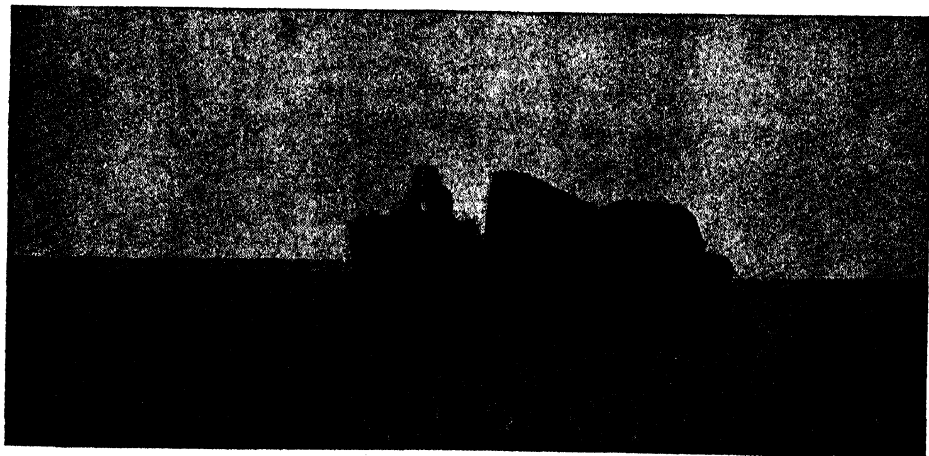
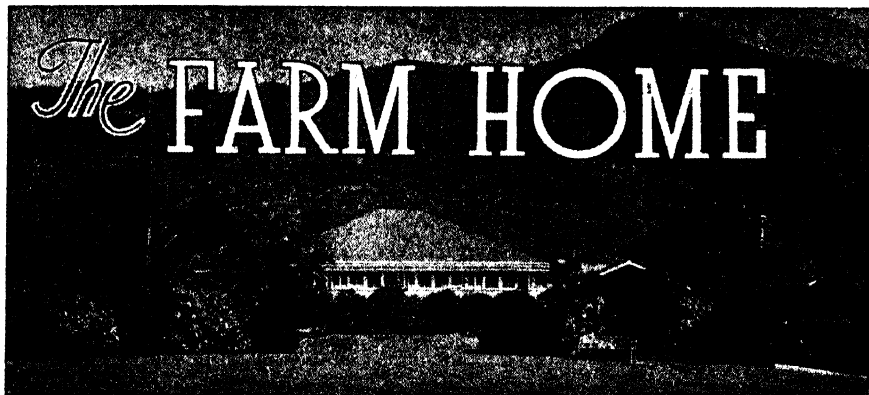


Plate 29.

A HEADER-HARVESTER READY FOR ACTION.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SUMMERTIME "DO'S AND DON'T'S."

- D**O protect milk and other foods from flies and dust. Keep all foods cool, clean, and covered.
- DO** protect the children's eyes from sun and glare. It is cruel to take them out without a hat in this climate, and may easily cause eye troubles.
- DO** give baby his sunbaths in the early morning, especially at the seaside. The fine tender skins of babies are easily burnt.
- DO** visit or write to the Sister at the nearest Maternal and Child Welfare Centre before taking the children on a journey. The Sister can give a lot of hints on how to make things easier when travelling.
- DO** provide interests such as outings, some new back-yard toys and games (these are easily made out of odds and ends of timber) for children who are not having holidays away from home this year. The busy interested child is a happy child.
- DO** keep children out of crowds whenever possible.
- DO** make things easier during the holidays by doing less cooking. Home-grown salads with cheese or eggs or home-cooked cold meat, and puddings made with fresh fruit are just as nourishing and much more appetising on summer days than hot cooked meals. Try some new salads and vary the dressings for the grown-ups.
- DO** use vegetable juices, such as carrot juice, if fruit is too expensive or difficult to obtain.
-
- DON'T** overclothe the children on hot days. Provided their heads are covered they are happier in one or at the most two simple loosely-cut garments. This saves washing, too.
- DON'T** allow children to remain in clothes very wet with perspiration, or prickly heat may result. Cool baths and a good talc powder will help to prevent this.
- DON'T** overfeed the baby and toddler, especially with fat. Give plenty of cool water to drink between meals. In very humid climates, add a pinch of salt to the water.
- DON'T** allow the children to be over-exposed to the sun, especially on the beach in the middle of the day.
- DON'T** put a handkerchief over the baby's face; it makes him hot and deprives him of fresh air.

DON'T let children become overtired—the cross naughty child is usually a tired child. Even if they do not sleep, children up to 5 years of age should have a rest of one hour's duration before the midday meal, and at least 12 hours' sleep at night.

DON'T let daylight saving make bedtime late. Children in England have always gone to bed in daylight because of the prolonged twilight.

DON'T give so-called cooling medicines. They are quite unnecessary. The right food, as advised by the Sister at the Welfare Centre, will keep the baby's system in good order.

Any further advice about hot weather and holiday care may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

In present circumstances recommendations are, of course, subject to the availability of ingredients mentioned, or of suitable substitutes.
Cottage Broth.

Remove fat from 1 lb. scrag end of mutton and cut meat into small dice. Cut the following into dice also: 1 carrot, 2 onions, 1 swede turnip, 2 sticks celery, 1 parsnip, and 1 small potato. Melt 1 tablespoon good dripping in a saucepan, add meat and bones, and fry until brown, add 4 oz. well-washed rice and fry a few minutes longer. Add vegetables, salt and pepper, and 1 teaspoon sugar, and fry for a few more minutes. Add 5 pints stock or water and bring to boil slowly. Simmer for 2½ hours; remove bones and skim off fat, add 2 teaspoons finely-chopped parsley, and serve piping hot.

Mutton Broth.

Cut meat off bones from 1 lb. scrag end of mutton, remove fat and cut meat into dice, then cut up bones. Put them into a large saucepan with 3 quarts water and 4 oz. well-washed barley. Bring to boil and simmer for 1 hour, skimming it well during the cooking. Now add 2 carrots, 2 sticks celery, 2 turnips, cut into dice. Simmer for 1 hour longer, then remove bones. Remove fat, add a little finely-chopped parsley, pepper and salt to taste. Serve piping hot. Is is a good idea to cook 3 or 4 mutton shanks in the soup, and these can be served separately with onion, caper or parsely sauce.

Potato and Cheese Soup.

Take 1½ lb. potatoes, 2 oz. grated cheese, 1 small onion, 1 oz. butter, 1 quart vegetable stock, ½ pint milk, 1 carrot, seasoning. Peel the vegetables and cut into small pieces. Fry the onion and carrot for a minute or two in the butter, taking care not to let them colour. Add the potatoes, seasoning, and the stock. Bring to the boil and allow to simmer with a lid on until the vegetables are soft. Whisk up the soup until smooth or put through a wire sieve. Add the milk and, if necessary, some more stock or water. Heat up the soup—do not reboil. Put into a hot tureen or individual cups and sprinkle the grated cheese on top.

Corned Beef Stew.

Melt 2 level tablespoons butter in a saucepan, add 2 finely-chopped large onions and fry until light-brown. Add 2 cups diced beef, 6 peeled and halved tomatoes, 2 cups cooked haricot beans. Bring very slowly to boiling point, season with pepper and salt, and simmer very gently for 10 minutes. Make a border of mashed potato and fill centre with stew. Sprinkle with chopped parsley.

Cornmeal Pikelets.

Sift ½ cup self-raising flour, ½ cup cornmeal, pinch salt, and 2 tablespoons sugar into a basin; beat 1 egg well, add a little more than ½ cup milk. Pour into centre of flour and mix well together. Dissolve ½ level teaspoon bicarbonate soda in about 1 tablespoon boiling water, add to batter with one dessertspoon melted butter. Beat well and bake in spoonfuls on a hot, greased girdle. Serve with honey or maple syrup.

QUEENSLAND AGRICULTURAL JOURNAL

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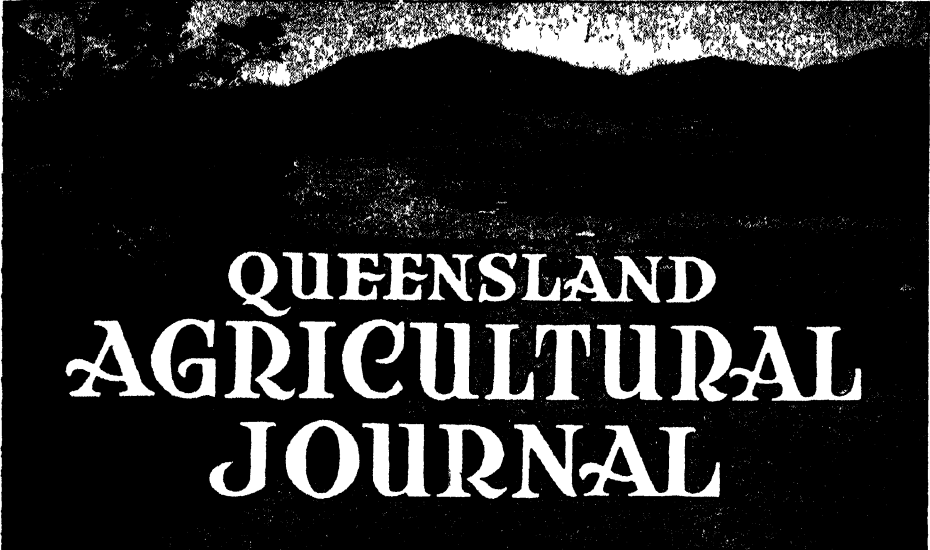


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Volume 58

1 FEBRUARY, 1944

Part 2

Event and Comment.

Food Production a Major War Service.

AS one of Australia's major contributions to the wartime needs of the United Nations, the importance of food production has been stressed again and again in different ways during the past few months. Australian farmers' increasing output is a credit to all concerned, especially in view of the difficulties under which so many of them are working. Splendid as this effort is, there is need for even greater production in 1944, which is regarded as the critical year of the war. Food is, obviously, among the most vital necessities at the present time, and the maintenance of supplies sufficient to meet Commonwealth commitments has been a huge task and one made harder by the unavailability of many farming requirements and often, also, by seasonal circumstances.

Production objectives for this year have been fixed for beef, mutton, pig meats, butter, cheese, eggs, sugar, wheat, potatoes, and pineapples; also for cotton and tobacco. Every farmer is now urged to grow a bit more to shorten the war.

Early in the war, food was plentiful in Australia while munitions were not. So agricultural implement works changed over to munition production. At this stage, Australia had a "surplus production complex." Then Japan and the United States of America came into the conflict. For Australia, this meant a very great addition to the armed forces in Australia. There were many more mouths to feed. Conditions necessitated the mobilisation of man-power and all our other resources. Despite these circumstances—diversion of labour, materials, and machinery and the depletion of fertilizers and shortage of other essentials—Australia managed to maintain the level of production and, in some cases, actually raised it; but food demands were

ever growing. And now this year there will be very much heavier demands on the agricultural and pastoral resources of this country. Consequently, food objectives providing for substantially augmented production in practically all staple foodstuffs have been set for 1944. Even if these objectives are attained, the additional output will be soon absorbed because of steadily expanding needs. That is why in the fifth year of war the people of Australia are being asked to restrict their use of basic foods and to assist in every other practical way in solving our provision supply problems.

If this food production campaign is to succeed, the complete co-operation of all concerned is necessary. Efforts are now being directed towards easing the rural labour position and to have other agricultural requirements made available so that Australia may continue as one of the main food bases of the United Nations. After all, Britain and our Allies have the right to call on us for sustenance, as we have to call on them for armed assistance and for war material.

The more fighting men who come to the south-west Pacific, the greater will be the demands on Australia's food economy, which must therefore be a factor of very high importance in our general strategy. In fact, it is a fair assumption that the proper handling of food production in all parts of the world will make or mar both the progress of the war and the later establishment of peace; therefore, food must necessarily have a tremendous influence on the saving of our civilisation.

What the British Farmer Has Done.

BRITISH agriculture is certainly pulling its weight in the war. Last year, with helpers in every district, including the Women's Land Army—now 70,000 strong—week-end workers from towns and cities and volunteers of all ages who spend a week or two in organised camps, the farmers of Britain gathered an overall harvest of 100,000,000 tons. The job undertaken by them was to plough and crop and harvest and deliver food to the nation as well as to grow food for their own stock. To do that they took the plough right round the farm, bringing into production thousands of acres in which a furrow had rarely been opened before. Increased production of milk, vegetables, and other field crops has caused a corresponding diminution in beef and mutton production. The additional area brought into cultivation has more than offset, however, the loss of crop land to military and industrial use. Loss of agricultural workers to the Services was another handicap, but the willingness of those remaining to work harder and longer hours and mechanisation of production overcame it. All this could not have been done, of course, without planning and organisation, in which district war agricultural committees took a notable part. These committees made up largely of practical agriculturists advised, assisted, and encouraged farmers when necessary and directed the food production campaign. In doing a splendid job they control and administer reserves of labour, machinery, fertilizers, and other farming requirements. Not only that, but they have taken over and worked badly-run farms and have brought derelict land into profitable production. And through their technical sub-committees they let fellow farmers know what is doing in the way of new developments in machinery and equipment and improved farming practice. Naturally, lessons had to be learned from failures and mistakes, but the facts remain that the people of the Old Country have not starved, their "morale" was never higher, and many thousands of acres of formerly unproductive land is now part of the "Garden of England."



Haymaking.

L. M. HODGE.

(Continued from page 16 of January issue.)

HAYSTACKS.

THE frequency with which heavy rains are experienced in Queensland renders it necessary that haystacks be built on a site above flood level, well floored, soundly constructed, and securely roofed. A suitable base may be constructed from bush timber by laying stout saplings about 8 inches apart across bedding logs of 10-inch diameter spaced 6 feet apart on the site of the stack. Alternatively, a permanent floor may be made with loose stones built into a level platform about 1 foot high.

The shape and the size of the stack should be determined before building is commenced. Round stacks are convenient for small quantities of hay, but require more skill in topping off than do square or rectangular ones. As a rule, the best type of stack is that which exposes the least possible amount of hay to the weather, and the rectangular stack satisfies this requirement.

In determining the size of the stack to be built, the tonnage of hay to be stacked has first to be estimated. Working on this estimate, and using the following table, the amount of space to be provided may be calculated:—

CUBIC FEET PER TON OF HAY.

Period.	Oats.		Wheat.		Lucerne.
	Sheaf.	Loose.	Sheaf.	Loose.	
Freshly stacked	350	400	400	500	400-450
One month after stacking . .	300	350	350	400	350-400
One year after stacking . .	300	325	325	350	300-350

The required size of stack for an estimated amount of hay may be ascertained by reference to the following table, which shows the length

of stacks of various sectional dimensions required to store 1 ton of average hay:—

Average Width.	Height to Eaves.	Height of Pitch.	Length for One Ton.
Feet.	Feet.	Feet.	Feet.
10	8	4	4.0
10	10	5	3.2
12	10	8	2.4
12	12	8	2.1
13	10	8	2.2
13	10	10	2.0
14	10	10	1.9
14	12	10	1.7
14	14	10	1.5
15	12	10	1.6
15	14	10	1.4
16	12	10	1.5
16	14	10	1.3
18	12	10	1.3
18	14	10	1.2
20	14	10	1.0

Where large amounts of hay are being conserved it is advisable, in order to lessen the risk of total loss by fire, to build separate stacks suitably spaced and each containing no more than 50 tons of hay.

Building Haystacks.

It is important in constructing haystacks, whether of loose or of sheaved material, that the centre be higher than the edges upon the completion of each layer. The straws throughout the stack should tend downwards and outwards, in order to prevent beating rain making its way into the stack from the sides and to divert to the outside any water which may penetrate the roof.

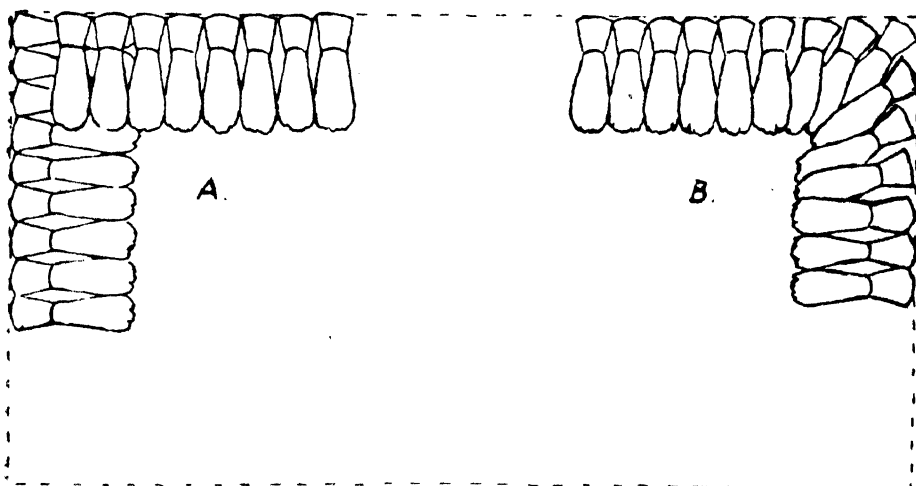


Plate 30.

COMMENCING A STACK OF SHEAVED HAY.

When stacking sheaved hay, a bed of loose material, such as straw or loose hay, should be laid on the floor so as to give a rise of about 18 inches from the edges to the centre. Stacking of the sheaves is usually commenced at the edge of the stack. The outside layer consists of sheaves laid side by side as closely as possible with butts outward and their line accurately defining the ground area of the stack. The corners may be turned in either of two ways, both of which are illustrated in Plate 30. The method shown at B makes the stronger corner, unless the sheaves are very short. The longest sheaves should always be used for the outside lines, and particularly for the corners, as they lock more securely than short sheaves.

The second row is placed shinglewise upon the first, butts outward, leaving about 1 foot of the first line exposed. This is a binding row and follows the outside row right round the stack. Successive lines of sheaves, each one nearer the centre, follow until the centre is reached, where a line of sheaves laid lengthwise makes the centre line solid.

The stack is built in this way to the eaves, which are formed by projecting the two topmost outside lines of sheaves 4 inches to 6 inches beyond the edge of the stack. The pitch of the roof is then made by laying each successive outside line of sheaves inside instead of directly

above the last, the floor of the stack thus becoming smaller with each successive layer of material, until the final layer is only as wide as a sheaf is long (Plate 31, fig. AA), and the sheaves, placed head to butt, overlap each other completely.

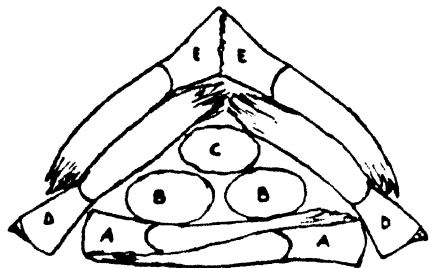


Plate 31.

RIDGING AND CAPPING A STACK OF SHEAVED HAY.

The first layer of the ridging sheaves (Plate 31, fig. BB) consists of solid, well-bound sheaves laid lengthwise and fastened together in pairs with a hayband to prevent them from spreading. Upon these are laid

a single line, butts overlapping heads, to form the ridge (Plate 31, fig. C).

The capping sheaves consist of a line (Plate 31, fig. DD) laid butts down against the ridge so that their heads overlap on the ridge line C. These should, for security, be held in place with stakes pushed through them at several places and connected with a line of binder twine. The final capping sheaves (Plate 31, fig. EE) are placed astride the lines DD, butts upward. These are fastened together with a hayband in order to make them firm and secure at the peak. To make the hayband, a handful of hay is bent out on each side of the string tying the sheaf and twisted to form a hayrope attached to the string band of the sheaf. The end of this hayrope is then twisted into the string of the companionate sheaf and the two are firmly tied together and may be placed astride the ridge. When completed, the whole capping should be made secure with stakes and twine.

Thatching and Roofing.

However soundly it may be constructed, a haystack may be partially or wholly ruined unless it is secured against entry of rain water. A straw thatch may provide insufficient protection against heavy rains, unless the work is done by a highly skilled thatcher, and it may therefore be advisable for all stacks built in the open to be provided with

a galvanised iron roof, more particularly if the hay is not to be used for some considerable time. For a gable-roofed stack, such as has been described, the iron may be nailed to 3-inch by 2-inch hardwood battens and capped with ridge-capping. A 10-foot sheet of iron on each side will cover a stack 15 feet in width, provided the pitch of the roof does not exceed 7 feet.

A turtle-backed roof (Plate 32) has given good results in Queensland. It consists of curved 24-gauge corrugated galvanised iron, the curve being formed by bolting two 10-foot sheets, each machine-curved to a 12-inch spring, end to end. This union forms an arch having a span of approximately 15 feet, with a height of 42 inches. The advantages of this roof are ease of construction and handling and security from both wind and rain. The cost of a turtle-back roof to cover a 50-ton stack is about £20.

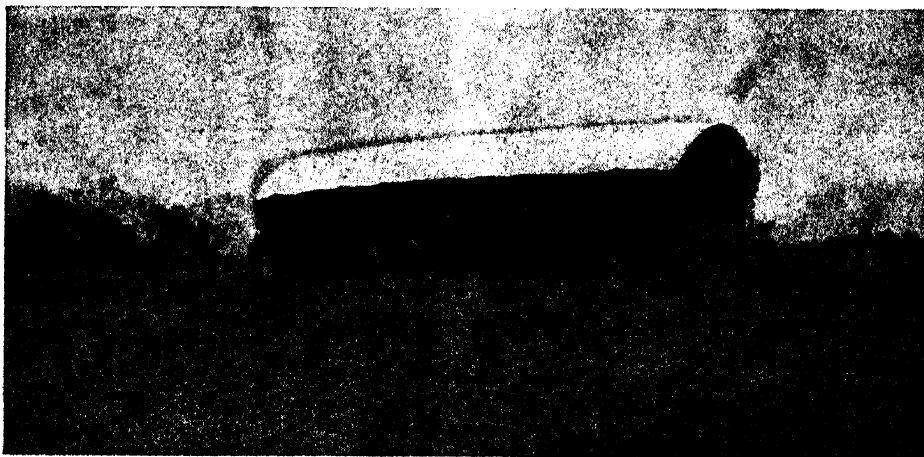


Plate 32.

A 50-TON HAYSTACK WITH TURTLE-BACKED ROOF.

It is necessary to punch and assemble this type of roof on the ground. A convenient stand for this purpose may be made by fixing a stout rail parallel to a level piece of ground and at a height of 42 inches above it. The rail should be about 12 feet long, in order to carry three pairs of sheets of iron and to leave sufficient working room. The pairs are bolted together, as shown in Plate 33. When three pairs have been joined, the rear or first pair is unbolted and the sheets numbered 1 and 1A, care being taken that the lettered number is always on the same side. Another pair is then fitted to the working edge and the procedure repeated until the whole roof has been assembled, numbered, and taken apart ready for building on top of the stack.

When punching the bolt holes it is advisable to avoid making them too neat for the $\frac{1}{4}$ -inch bolts, as some play is necessary to permit the bolts to be passed through the several sheets of iron when working on the yielding stack. The sheets are joined at the top of the arch by three bolts, the outside bolts also holding the overlap of the neighbouring pairs, an overlap of 6 inches being given. Two bolts are inserted down each side of each 10-foot sheet, so that each complete arch is joined to its neighbour by five bolts.

The prepared sheets are hauled on to the stack in a suitable rope sling, and the builder bolts the first pair together, with the outside and centre bolts at the top of the arch. The next pair is joined by the centre bolt only, before the set is joined to its neighbour. Two men are required for this work.

Care must be taken to secure the turtle-back roof against sudden winds while it is being fixed. Cables of strong galvanised fencing wire should be passed over the roof at intervals of 4 feet and sufficient weight suspended from each end. The wires and weights should be left on the stack in order to hold the roof securely, but the weights must not be permitted to reach the ground as the stack settles.

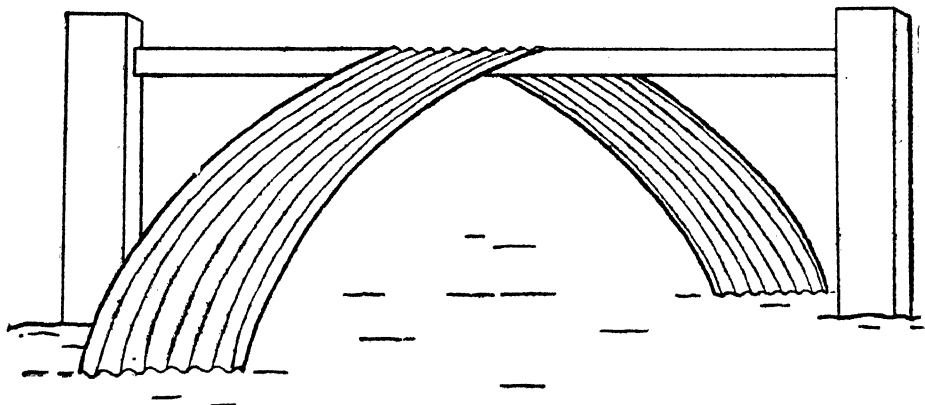


Plate 33.
BOLTING OF IRON SHEETS.

Protection from Vermin.

Haystacks may be protected from mice by surrounding them with a fence constructed of 6 feet by 3 feet plain galvanised iron sheets running lengthwise with the edges let into the ground to a depth of 6 inches. The fence is generally built with a lean outwards of not less than 6 inches from the perpendicular. It is advisable to solder "eyebrows" at the tops of the corners. While galvanised iron fencing is expensive, it is extremely durable.

BALING HAY.

For marketing purposes hay must be put into bales, unless it is chaffed and bagged. In Queensland, the market demand normally is for chaff rather than hay, but for drought-feeding of sheep baled hay is widely used. Where hay is conserved on the farm or pastoral holding, stacking in the baled condition is preferable to storage as loose hay, since baled hay is more conveniently handled, transported, stored, and fed to stock in the paddock.

Baling of hay may be carried out in the field from windrows, cocks, or stooks, but in cases where it is desirable to remove the hay to shelter as rapidly as possible, baling is most conveniently done from the stack. In order to avoid losses due to heating under pressure in the bales, the hay should not be baled in the field until the moisture content has been reduced to a somewhat lower level than the maximum permissible in loose hay at the time of stacking. The regulations under "*The Stock Foods Acts, 1919 to 1935*," limit the amount of moisture allowed in

hay offered for sale to 12 per cent. by weight, unless the actual amount is declared on the invoice and at the time of sale.

There are two main types of hay press in use—namely, the box, derrick, or dump baler and the perpetual press. In making bales with the former type of press, the hay is fed into the press in several portions or charges, and each portion is compressed separately by a plunger or ram. Unless special care is exercised in filling, the hay tends to become somewhat tangled in the bale and cannot be easily separated into portions when being fed to stock. For this reason the hand-pressed bale, which results from continuous pressure in a perpetual press on a heap of hay in a frame, is favoured by purchasers intending to feed the commodity in the form of hay.

In preparing hay for the market, the farmer should bear in mind the regulations under "*The Stock Foods Acts, 1919 to 1935*," dealing with weight of battens on bales and with foreign ingredients. The total weight of battens on each bale must not exceed 10 per cent. of the gross weight of the bale. In order to achieve this and to provide for a uniform pack, no more than eight battens should be used on each bale. The battens should not be longer than the bale itself and they should not exceed 3 inches in width nor half an inch in thickness. The presence in hay offered for sale of plants, parts of plants, and seeds of Bathurst burr*, Noogoora burr†, castor oil plant‡, thorn apples§ (also known as datura or stramonium), dodder||, corn cockle||, khaki weed**, poppy††, and prickly poppy‡‡ is prohibited.

* *Xanthium spinosum*.

† *X. pungens*.

‡ *Ricinus communis*.

§ *Datura* spp.

|| *Cuscuta* spp.

¶ *Agrostemma githago*.

** *Alternanthera repens*.

†† *Papaver* spp.

‡‡ *Argemone mexicana* var. *ochroleuca*.

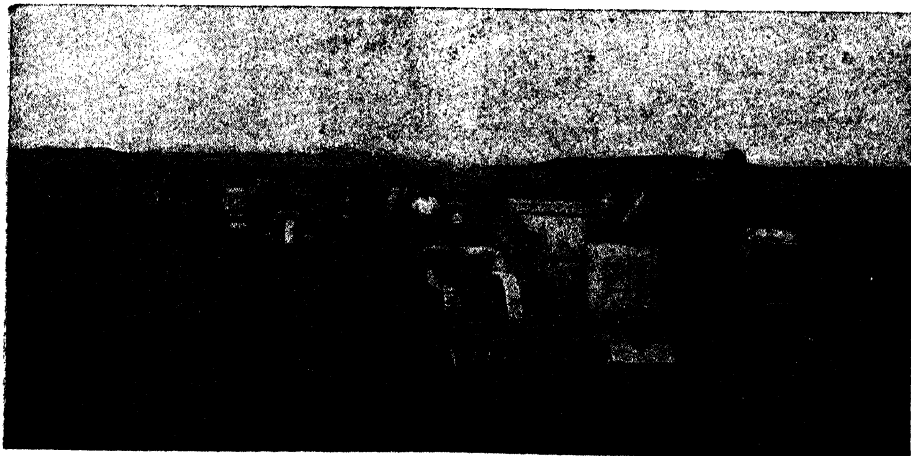


Plate 34.

A WHEAT HARVESTING SCENE ON THE DARLING DOWNS, QUEENSLAND.



Cotton Harvesting.

W. G. STEELE, Instructor in Cotton Culture.

MANY cotton crops are now approaching the harvesting stage, and it is emphasised that care and thought expended on the harvesting operation will be well repaid. With the present shortage of labour, many growers will probably find it necessary for their families and themselves to pick more of the crop than in normal times. It will be advisable, therefore, in such cases to commence harvesting as soon as reasonable tallies can be obtained. Usually this would be when there is approximately 200-300 lb. per acre of open cotton or an average of four to six well-developed open bolls per plant in a field with a normal stand of plants. By starting then, the picking can be completed before there is a large number of open bolls per plant, thus reducing the possibility of storms damaging much of the crop.

HAND PICKING.

Cotton, when it first matures, has a brightness or "bloom" which must be preserved if top grades are to be realised; hence, it is advisable to harvest the cotton before rain and sunlight have dulled its colour. Prolonged exposure to the weather may badly stain cotton and also cause it to lose weight; furthermore, strong winds tease out the locks so that dust and trash are impregnated in the fibres, thus increasing the difficulty of cleaning at the ginnery and thereby lowering the grade of the resultant lint cotton. (Plate 35.) In addition, loss of crop is often brought about by the locks being blown on to the ground, where they become so dirty and discoloured that they should not be harvested.

On the other hand, care should be taken not to harvest any cotton which has not had time to dry out properly after opening. This "green" cotton, as it is called, has a characteristic shiny, matted appearance, which is easily recognised amongst the more mature cotton in the bale. The fibres of green cotton are usually cut considerably during the ginning operations and the resultant lint is of a type unsuitable for many spinning requirements, which necessitates it being sold at a reduced price. Moist, green seed cotton also tends to sweat and thus stain any cotton with which it is packed in a container. This also applies to seed cotton which has been wet by rain or heavy dew. Cotton which has been wet by rain should be allowed to dry out for two or three days before it is picked. This also gives the sun and wind a chance to

fluff out the matted fibres, thus making picking easier and also improving the appearance of the cotton owing to the bleaching action of the sun. Where pickers are employed, drying is especially important as the added moisture can cause a considerable increase in weight, for which the grower has to pay. Where heavy dews are experienced and the cotton contains an excess of moisture for the first few hours in the morning, it is necessary to spread the contents of the picking bag on to suitable containers—such as spare bales at the end of the rows. If this cotton is turned once or twice during the morning it will be dry enough to bale up with the remainder of the day's pick.



Plate 35.

ILLUSTRATING COTTON WHICH HAS BEEN LEFT UNHARVESTED TOO LONG.

Particular care should be taken to see that no hard, dirty, or diseased locks are picked. (Plate 36.) Such locks, although forming only a small proportion of the total cotton picked, when scattered throughout a bale will greatly reduce its value. A fairly safe rule is to pick only cotton which is fluffed out, as in this way diseased, immature locks—which are usually composed of matted fibres—are eliminated. A fair amount of leaf in the sample is not highly detrimental provided it

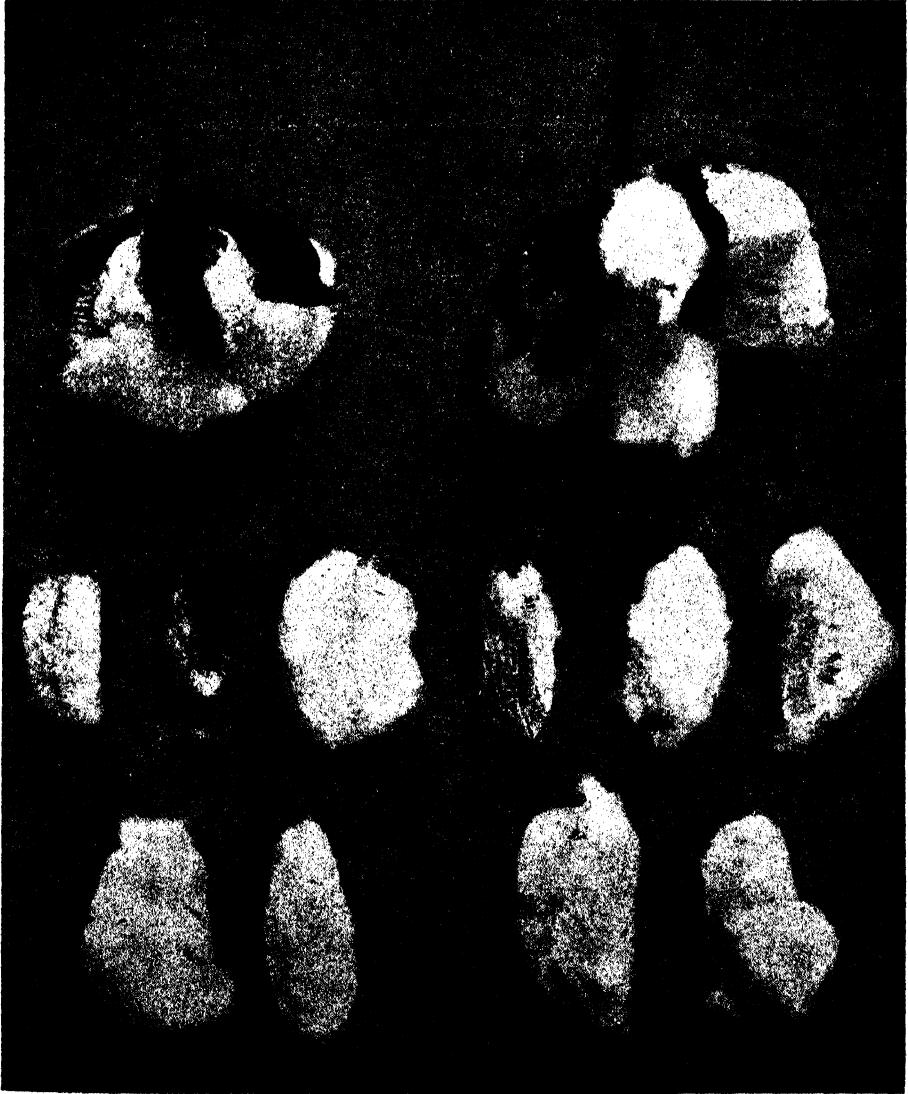


Plate 36.

ILLUSTRATING LOCKS OF COTTON THAT SHOULD NOT BE PICKED.—The locks arranged below the bolls are comparable with those contained in the bolls. None of these locks should be included in mature hand-picked cotton, as they are so much waste and the fibres of the fluffed-out locks are soft. During the ginning operations they would be cut and mixed with other fibres, thus giving the rest of the cotton a wasty appearance which will reduce the value of the whole bale of cotton.

is not too fine. Large pieces of leaf can be removed by the cleaning processes at the ginneries, but the finely crushed up particles become entangled in the fibres and are difficult to remove. Some pickers have the habit of squeezing the cotton between the hands to make a smaller bundle before placing it in the bag—this crushes the leaf or dried bract into smaller pieces and is, therefore, not advisable. Green leaves should never be included in the picking bags, as the natural oils present in the plant tissues will badly stain cotton with which they come in contact.

Every effort should be made to pack only a uniform grade of seed cotton in the container forwarded to the ginnyery. This will not only enable a high standard of efficiency of grading to be maintained but will also expedite the carrying out of the grading operations, which is an important factor—especially during rush periods in the ginneries. In addition, the grower is ensured of receiving the full value of the cotton in each container. Where mixed lots of cotton are packed in a container payment is made on the basis of the lowest grade and staple length contained therein. The grower has to exercise care, therefore, in not only segregating the pickings of his crop into the different grades of cotton but also into the different staple lengths and qualities.

Unfortunately, on most farms considerable variation may exist in the quality and length of staple of cotton grown in various parts of a field. For instance, plants growing on deep, sandy spots or on hard clay patches, where most of the rain runs off, will in dry seasons produce cotton with a weaker fibre and probably shorter staple than will the more moisture-retaining portions of a field. Also, the lower parts of slopes, where the gradient lessens and the rains have a better chance of penetrating, will normally produce cotton of better quality and length than further up the slope, where run-off is greater and consequently the plants receive less moisture. Differences of up to 1/16 of an inch have been observed in the staple length of cotton under these circumstances. In some seasons, where the crop has been growing on a restricted water supply in portions of a field, the bolls will be forced open earlier than in the rest of the field. These patches should be picked as soon as sufficient cotton is available, as this cotton may be sufficiently weak and short to make it advisable to segregate it from the remainder of the crop.

It is advisable, therefore, to pick and bulk together the cotton from portions of a field where the crop has developed under similar conditions and bale this cotton separately from that harvested from other parts of the area. It is not feasible, of course, to take note of all small irregularities which exist in a field, but in the course of the season's cultivating the grower is able to form a fairly good idea of where his best cotton is likely to be produced and can accordingly mark off these areas. Where the field contains very long rows it may be awkward to harvest these areas separately under the usual methods of baling the cotton, but the use of a portable baling press will greatly facilitate the baling of cotton from these separate areas.

SNAPPING.

Under normal circumstances this method of harvesting cotton should not be used until the plants have been killed by frosts. Prior to this, the moisture present in the plant toughens the stems of the bolls, thus

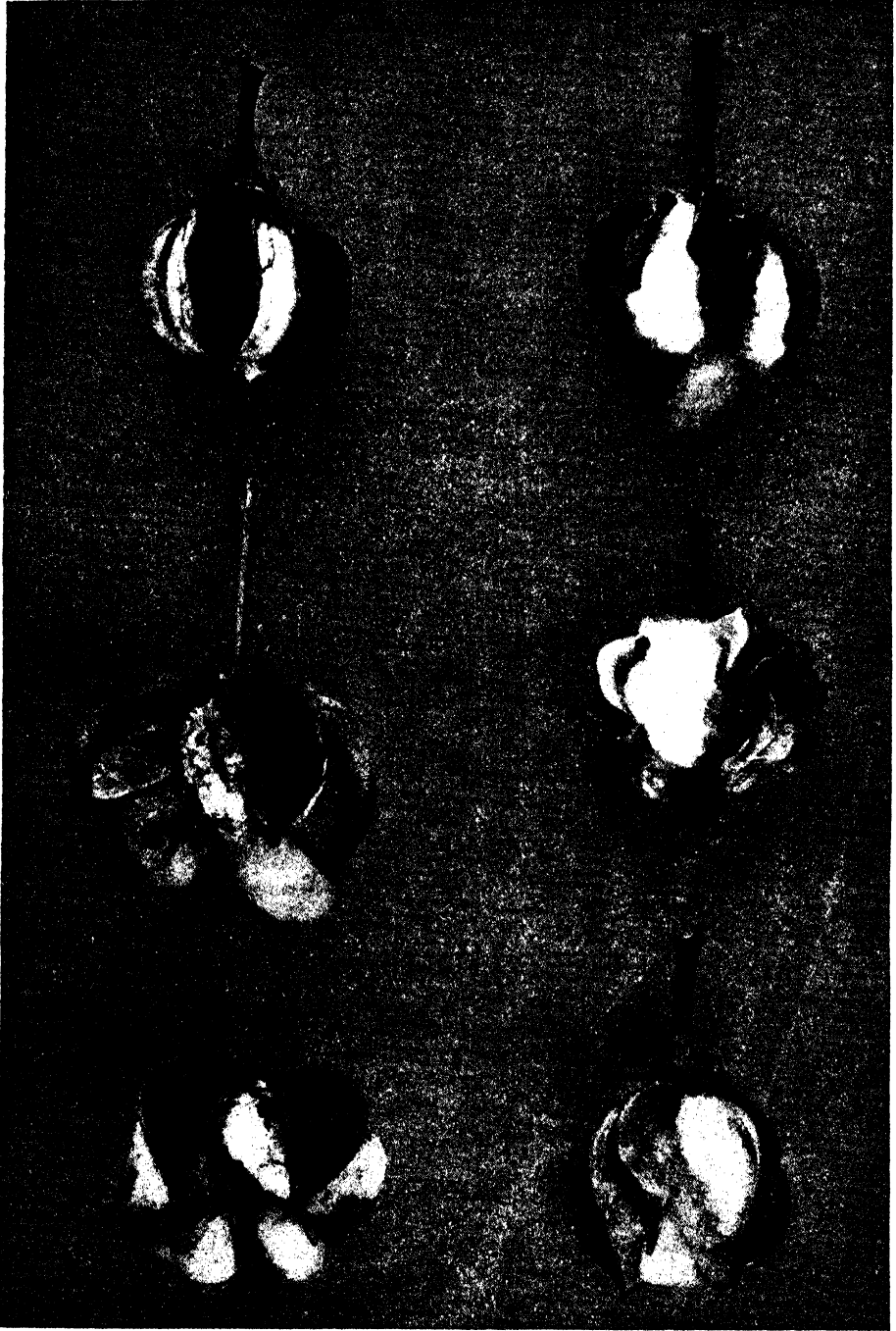


Plate 37.

BOLLS THAT SHOULD NOT BE SNAPPED—The fibres of the few locks they contain are so soft that the ginning operations would twist and cut them so badly that they would seriously lower the quality of any good cotton ginned with them. Much snapped cotton is ruined each season by the inclusion of such bolls, and the sending of such rubbish to the ginnery should definitely cease.

necessitating a very strong pull to remove the boll, thereby slowing up the snapping, and, in addition, the plant is often badly damaged through whole branches being torn off. The moisture present in the partially dried out boll is also a handicap in that the grower pays for the picking of a large amount of unprofitable material. An additional disadvantage of moisture in the snapped material is that it causes "sweating" in the packed container, which greatly increases the difficulty of properly cleaning the cotton at the ginneries.

In general, snapping cotton lowers the grade, so that any saving which may be obtained by using this cheaper method of harvesting is offset by the lower values received for snapped cotton. The lowering of the grade of snapped cotton is also accentuated by the fact that immature and diseased bolls are usually included in the snapped material, as the picker as a rule does not discriminate between sound and partially diseased bolls (Plate 37). Snapping may result, therefore, in considerable unprofitable expenditure being incurred by the grower. Firstly, he pays for picking material for which he receives no return, as the cleaning machinery at the ginnery rejects all the waste and the grower is paid on the weight of seed cotton which is produced from his snapped material. In addition, he sends away a greater bulk of material than if the cotton had been hand picked, which entails additional expense for carting to the railway station, more wear and tear on his bales, and also heavier treatment costs at the ginnery.

Under certain circumstances, such as where only a very light top crop has been produced or where the main crop has been unavoidably left unpicked so long as to become badly weathered, it may, however, be found more economical to snap than to hand pick. When the bolls have been exposed to the weather for any extensive length of time the stems become brittle and the whole burr is likely to come away in the hand when an attempt is made to pick the cotton in the ordinary way; this slows the picking to such an extent that payable tallies cannot be obtained and either higher rates must be paid for a clean pick or the crop must be snap picked. In this case, it is probably preferable to snap as even if a clean pick at the increased rate were considered payable the amount of burr which would still get into the picking bags would cause a reduction of the grade of the cotton.

Unless there is a good reason for snapping the main crop, clean picking is preferable; but the top crop of bolls, which as a rule contain cotton of a poorer quality, may be snapped. This top crop would normally have to be picked at the rate ruling for a clean-up pick and the difference between this price and that for snapping makes it advisable to snap such cotton.

BALING.

Reference has been made earlier in this article to the need for packing a uniform grade of seed cotton in each container, so that this point needs no further emphasis. An important point to observe, however, is to make sure that all stray locks of cotton are cleaned out of the container before it is refilled so as to prevent any possible seed admixture from this source.

There is a tendency among some growers to stamp as much cotton as possible into each container so as to reduce the number of them

required to forward the crop and thereby cut down cartage costs. This is not advisable, however, for the continued tramping and compressing of the cotton forces the pieces of trash and dirt more deeply into the locks, with the result that cleaning of the cotton both prior to ginning and spinning is rendered more difficult than if the seed cotton had been loosely packed to weigh roughly 470 lb. per bale. This weight also assists in the ginning operations in that three bales or wool packs of seed cotton will contain the equivalent of one bale of ginned cotton, thereby enabling the changing from one grade of cotton to another to be made more efficiently.

The usual type of baling stand, where a frame is erected and the wool pack is suspended by four pieces of wire, works satisfactorily, but as picking progresses and the scene of operations is removed further and further from the baling centre long hauls may be involved in large fields. A simple type of press mounted on a slide has many advantages, as it can be moved along the headland and thus reduce the carrying of the bags of cotton to a minimum. If the rows are very long the press can be located half-way down them and then moved across the rows in the same manner. A press of this type can be easily constructed with 4 by 1 or 6 by 1 hardwood for the sides and 4 by 2 or 4 by 1½ for the rails. It is made on the gate principle so that it may be taken down and stored flat if desired. A big advantage of a press is that the sides of the press take the strain when the bale is being packed so that bales last longer and retain their shape. A firm, square bale is more easily handled and stacking on trucks and railway waggons is greatly facilitated.

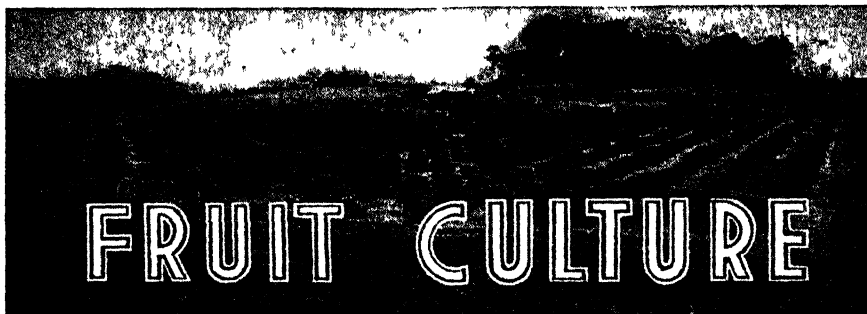
It is recommended that the grower's name, address, and registered number be branded on one side of the bale only and in such a position that it can be easily read when standing on its end. When the grader cuts the seam of the bale at the ginnery he makes the cut as he stands facing the brand and always on the same side. If the brand is placed on only one side of the bale the cut will thus be made down the same seam. When this seam has become too worn the brand can be obliterated and another face branded. The grader will then commence on another seam, which will be used as long as possible. In this way, more of the seams are kept intact and the bale remains in good shape, even if it is subjected to extensive usage.

The life of the bale will also be prolonged if the cut seams are resewn with a loose stitch that will allow the seams to separate slightly when the bale is repacked. This will enable the grader to cut the sewing string each time without damaging the bale.

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Packing Grapes for Market.

J. H. GREGORY, Instructor in Fruit Packing.

CAREFUL handling during harvesting is an essential preliminary to the satisfactory packing of grapes for market.



Plate 38.

Showing the method of placing all stalks upward in the picking basket so that bunches can always be handled by the stalks without touching the fruit. This assists in preserving the natural bloom on the fruit.

HARVESTING.

Grapes should be picked in the cool of the day and never while still wet by rain or dew. While being picked, the bunches should be trimmed of all small, damaged berries, care being taken all the time to keep the fruit as cool as possible. Large, roomy baskets make excellent picking containers, and when trimmed the bunches should be placed in these, stalks upward. (Plate 38.) The bunches should always be handled by the stalks in order to retain the natural bloom on the fruit. The baskets, when full, should be placed in a cool, shady position pending transport to

the packing shed. At the shed the bunches should be examined a second time, and any damaged berries missed at the first inspection removed. They should then be spread out on a flat table (Plate 39), on the cool side of the building, again taking care to place them carefully with the stalks up. This will assist in keeping the fruit cool, and also enable the packer to quickly select any particular size or type of bunch which he may need to fill a particular portion of a layer when packing.

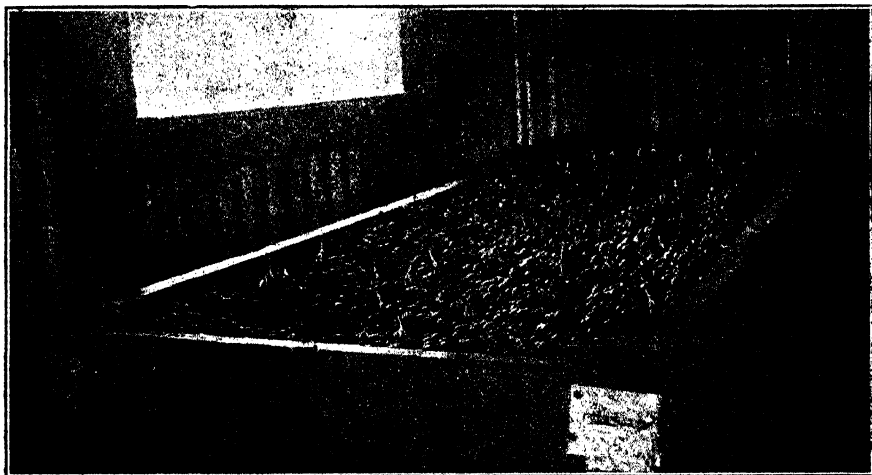


Plate 39.

Fruit spread out on the table prior to packing. Again notice the way all stalks are placed upwards to permit easy handling of bunches.

SWEATING OR WILTING.

It is advisable to sweat grapes for about twenty-four to forty-eight hours before packing. This is done by storing the fruit in a cool shed where the air has free circulation. Weather conditions have an effect on the sweating period, grapes in warm weather taking less time than in the cooler periods. After sweating, the skin of the fruit becomes tougher and more pliable, enabling it to be handled with greater ease and less risk of cracking the berries or damaging the fruit at the stalk. Sweating

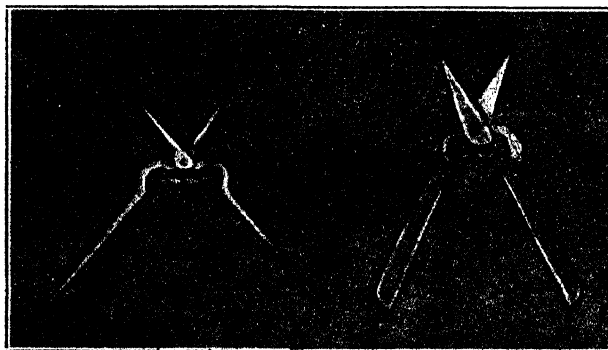


Plate 40.

Types of grape trimming clippers.

also helps to eliminate slackness in packing which is likely to develop during transit through shrinkage when bunches are packed without having been sweated.

PACKING.

Containers.

There are two types of half-bushel cases in use and a quarter-bushel case. Bushel cases are not recommended. The dump half-bushel, 18 inches long by $7\frac{1}{2}$ inches wide by $8\frac{2}{3}$ inches deep, is a good container, but the half-bushel standard case, 18 inches long by $5\frac{1}{4}$ inches wide by $11\frac{3}{4}$ inches deep is better. This container when in transit has not the same weight of fruit pressing on the bottom layer as the half-bushel dump case, the "standard" only having $5\frac{1}{4}$ inches of fruit as against $7\frac{1}{2}$ inches in the "dump." This is a factor for consideration where fruit is sent to distant markets. A quarter-bushel case is also used and is very popular on some markets. Growers are advised to consult with their distributors before using this package.

Selection of Fruit.

Careful selection of bunches also is an important factor in successful long distance marketing. Large, loose types of bunches should always be selected. Tight bunches are unsatisfactory, as they are harder to clean and trim without damage to the berries and should be sent to the nearer markets. Often the large, tight bunches contain many blemished berries in the centre of the bunch which can only be satisfactorily removed by cutting the bunches into sections. This is undesirable, as the value of the fruit is depreciated by reducing the size of the bunches. Bunches should be selected containing only large, even fruit. Bunches of small fruit are of low commercial value. It is advisable to leave a length of the stalk attached to the bunch when picking. This assists the packer when handling the fruit. Bunches with long stalks appear to carry and open in better condition than those with stalks clipped short.

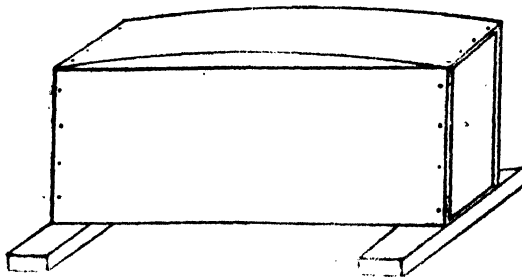


Plate 41.

Method of placing two pieces of timber on the floor of shed. This makes a good solid nailing down bench, and permits the bottom of the case as well as the top to bulge slightly when the lid is nailed on.

Packing.

The same system of packing is adopted in all types of cases. Packers should endeavour as much as possible to keep all stalks to the centre of the box so that when opened the cases on either top, bottom, or sides show a surface of fruit with practically no stalks visible. (Plates 42 and 43.) This style of packing is easily done. The case should be



Plate 42.

Method of placing the first layer. Note how all stalks are placed inwards and upwards so that only fruit will show if the bottom board of the packed case is removed.

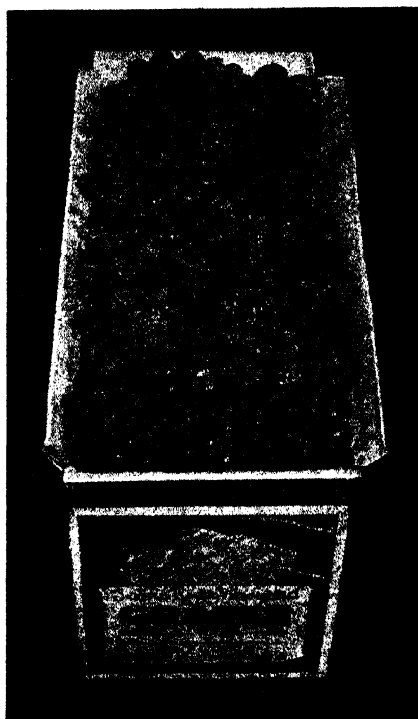


Plate 43.

Finished case before nailing down. Note how all stalks are carefully hidden. If care is taken, all sides of the case will open up showing fruit only.

lined with clean white or coloured paper and the fruit carefully placed in the case in layers. The first layer is started by placing the points of two bunches in the corners of one end of the box with the stalks to the centre of the layer but facing upwards and inwards. (Plate 43.) Bunches are then placed point first into the corners made by these bunches and the side of the box until the layer is finished. The space, if any, between the two lines of grapes of the first layer is then filled by placing bunches into the space with the points to the bottom and the stalks up. This presents a level surface of fruit free from stalks to the bottom of the case. The process is carried on until with the dump case the case is half filled, when the fruit is shaken into position by light bumping. Battens should be placed beneath the ends of the case while this is being done. The standard case should have the fruit eased into position when about one-third full and again when about three-quarters full. The case is finished by packing the fruit in layer by layer, bringing the fruit to a height of 1 to 1½ inches above the top of the case. Battens are then placed under the ends of the case, the paper folded over, the lid held in position with a gentle pressure placed on the fruit and the case. If sufficient care is taken, the bunches will not be injured in any way. After easing the fruit into position, and before finally nailing down, the lid should be removed and the top

of the case inspected. If by mischance any grapes are cracked these should be carefully clipped and removed. The secret of success in grape packing is to have the fruit tightly packed in the case to prevent movement whilst in transit. Movement in the finished case causes damaged and wet fruit, making consignments wasty and unsaleable.

COLD STORAGE.

Not every variety of grapes grown in Queensland is suited for cold storage. The best varieties in their order of merit are:—White grapes—Waltham Cross and Cervant; black grapes—Purple Cornichon, Black Malaga, and Black Muscat; red grapes—Red Malaga and Flame Tokay. This preference is based on the results of export consignments to the East, New Zealand, and Canada, and experimental packages stored in Brisbane.

After analysing the results of experimental consignments, the periods for which the several varieties may be stored with safety are:—Black Muscats, four to five weeks; Waltham Cross, five to six weeks; Purple Cornichon, Flame Tokay, Red Malaga, Black Malaga, and Cervant, seven to eight weeks.

It must be stressed that safe storage can only be achieved by every attention to careful handling.

Lining Paper.

Lining paper, if procurable, should be used with all packs. To save time, plain white or coloured paper cut to the correct size to fit the case should be used. For the $\frac{3}{4}$ -bushel, paper 12 inches by 20 inches wide is suitable and leaves a good margin for overlapping. The paper should be placed in the case neatly, as damaged or torn lining paper creates a bad first impression when fruit is being examined.

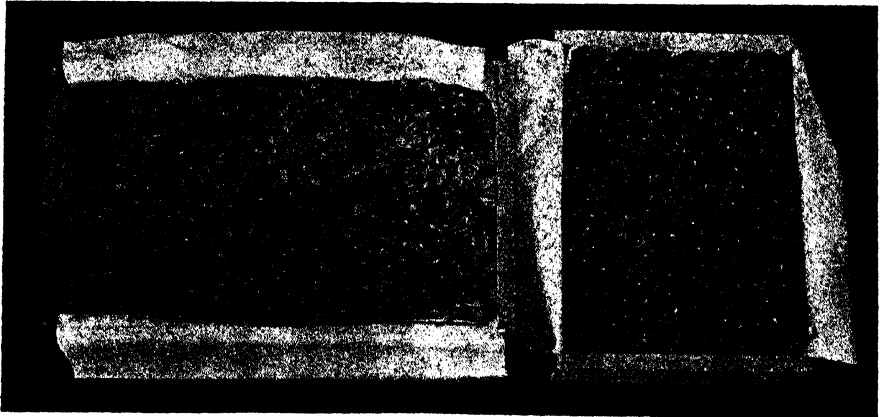


Plate 44.

Standard $\frac{1}{2}$ -bushel and $\frac{3}{4}$ -bushel case opened on the side showing the absence of stalks when the fruit is packed correctly.

Packing in Woodwool and Sulphite Paper.

Packing in woodwool and sulphite paper will present little difficulty. The case is first lined with paper, and then a pad of woodwool is placed on the bottom and around the sides of the box. The clipped bunches are then carefully wrapped in the sulphite paper and placed closely

together in the box. Only large-sized bunches should be used. Where bunches are small, two at a time can be placed in the one sheet of paper. This is preferable to wrapping small bunches separately. The packer should aim at having one layer of fruit in the case. From this it will be seen that only large bunches will adapt themselves satisfactorily to this pack. When the box is filled any spaces between the bunches are carefully padded with woodwool (Plate 45). A layer of woodwool is finally placed on the top of the fruit, and the lid placed in position. The sulphite paper should be cut at least 15 inches by 15 inches in size.

Special points to remember are—

Tease the woodwool into a soft pad.

Keep the bunches tightly packed and well padded so that there is no movement in the fruit after the lid is applied.

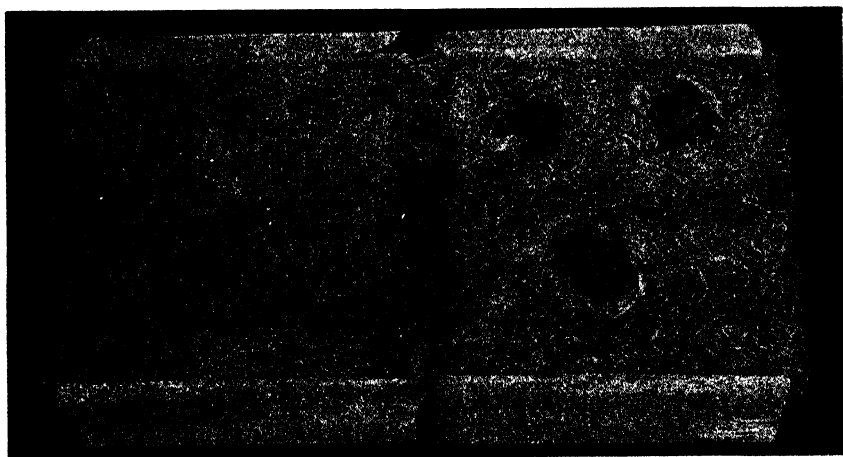


Plate 45.

Fruit packed for export using the sulphite paper and woodwool method of packing. The paper on three of the wrapped bunches is torn, to show the fruit.

Points to Remember.

Close attention to the following general points when packing grapes will assist greatly in obtaining satisfactory results:—

1. Clip—not pull—all blemished, diseased, and small berries from every bunch. Remember the export trade only wants very high-class fruit. Pulling causes waste.
2. Do not pick grapes after heavy dew or rain, but wait until the fruit has dried. Moisture is fatal to the successful carriage of grapes.
3. Avoid cutting up bunches as much as possible; small bunches or sprigs of berries spoil the sale of high-class grapes.
4. Sweat bunches in a cool, dry place.
5. Do not pack fruit while warm, but allow all fruit to cool completely before being packed.
6. Handle fruit by the stalks only. This helps to preserve the bloom on the grapes, and assists them to keep a fresh appearance even after a long period of storage.
7. See that all boards fit closely together when making up cases.

SHED EQUIPMENT.

The equipment necessary in the packing shed is not very costly. One set of small platform scales, long benches for laying out the grapes ready to pack, packing stands to hold the case while being packed, grape trimmers, case-making bench, wiring machine. The benches and stands can be made cheaply at home. Empty galvanised iron crates with the addition of legs make satisfactory benches.

LABELLING.

The use of a distinctive label is of great assistance from the display and advertising point of view, although these may be hard to obtain under wartime conditions. Labels should be bright and attractive. The design should have spaces left for printing all particulars, such as the weight and variety of grapes. To be complete the label should have embodied in the design the grower's name and address, and the words "Queensland, Australia" in plain letters in order to conform to the Commerce Export Regulations. A label 11 inches by 5½ inches will fit the end of the export case or standard half-bushel. The dump half-bushel label will measure a maximum size of 8 inches by 7 inches.

STENCILS.

Stencils, if used, must also conform to the Commonwealth regulations and Queensland Fruit and Vegetables Act by having the full name and address of packer, and where used for export the words "Queensland, Australia." Cases must also be branded with the name of the fruit and the weight contained in the case.

WIRING.

Wiring the cases when exporting or sending long distances is a necessity. The wires should be placed around the case $\frac{1}{8}$ inch from the inside edge of the ends. Two wires should be used, one at each end in preference to one around the middle of the box. Care should be taken to see that they are placed around the case parallel with the end. This is essential if the wiring is to give the best results. Often when packing for local markets two small boxes can be wired together to advantage.

TRANSPORT.

It is necessary to follow up good harvesting and packing operations by careful handling while the fruit is in transit to rail or wharf. The fruit should not be left where it can become wet. Carters should not walk on or sit upon packed cases. It is only by close attention to all these details that the perfect product can be delivered at its destination in a condition that will ensure satisfactory values.

THE COUNTRYMAN'S SESSION

Sunday Morning Radio Service to Farmers

(By arrangement with the Australian Broadcasting Commission)

Farmers are recommended to tune in to either a
Queensland National or Regional Station.

EVERY SUNDAY AT 8.30 a.m.

Vegetable Production

Vegetable-growing in North Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

VEGETABLE-GROWING may be divided into four classifications according to the purposes of production, viz.:—(1) home gardening, or the small-scale growing of a wide range of vegetables on town allotments or similar areas for home consumption; (2) market gardening, which is the commercial growing of a wide range of vegetables on small farms for local markets; (3) vegetable farming or the commercial production of large quantities of one or more vegetables for despatch to distant large markets; (4) cannery farming—*i.e.*, large-scale production of specialized varieties for canning purposes. In past years vegetable production in North Queensland has been practically restricted to home gardening and market gardening, and even these have been practised on a limited scale. The only serious and successful attempt at vegetable farming has been the tomato industry of Bowen and surrounding districts. Cannery farming has not yet engaged northern attention. Up to the present the local markets have been too small to absorb the produce of an expanded industry, and the handicaps connected with transport to distant markets have discouraged all attempts to establish a strong commercial vegetable-growing industry. Exigencies of war have, however, provided the necessary stimulus and recent production has demonstrated that there are very few vegetables which cannot be grown successfully in at least some part of the area.

With the present expansion of production, many growers are embarking on the growing of vegetable crops for the first time. Northern growers must first realise that climatic conditions are such that in very few places can planting practices of sub-tropical or temperate regions be followed with any great degree of success. Partial exceptions to this rule are the highland areas of the Atherton and Evelyn Tablelands and the Charters Towers area. Although lying within the tropics, these areas experience cold winter conditions, which necessitate, or at least permit, some degree of adherence to southern practices.

Generally speaking, the climatic cycle of North Queensland is a dry, hot spring, followed by storms in late spring and early summer, with monsoonal rains in late summer and autumn, and a dry winter. In the coastal area between Bloomfield River and Cardwell, and in the highlands adjacent to this strip of the north, the rainy season is protracted, lasting from January to May, but in other areas it does not extend beyond March. The planting of vegetables during the months of heavy rainfall is not generally practicable, owing to cultivation and weeding difficulties, bacterial and fungous diseases fostered by humid conditions, and the destruction of young plants by beating rain. In the hot, dry, spring months difficulties associated with high soil temperature, low soil moisture, and excessive transpiration make vegetable

culture precarious. It will, therefore, be seen that, under natural conditions, the northern vegetable season is restricted to the end of the wet season period and the drier winter months immediately following, making the utmost use of the accumulated soil moisture. In the inland areas subject to frost the grower must, however, curtail his planting of susceptible crops so that they may be harvested before the normal frost period.

It will readily be observed that a stable vegetable industry cannot be built upon the short, natural season that the climate permits. However, the use of irrigation allows the season to be extended by many months into a period when diseases and pests are less prevalent and when supplies are short. Thus, vegetable-growing can be made a profitable commercial venture.

Selecting the Site.

Before choosing a site for the vegetable farm it is necessary to consider the requirements of vegetable crops. Vegetable plants are highly specialized, and to obtain satisfactory results special conditions must apply. In the first place, most vegetables are short-term crops and, in relation to their period of growth, the amount of vegetative growth is considerable. For example, an ordinary crop of cabbage produces 10 to 12 tons or more of vegetation per acre in the short period of twelve weeks. This indicates that soils must be rich. When it is further understood that the root system of most vegetables is restricted it will be apparent that plant food must be readily available as well as plentiful. A rich and friable soil is, therefore, a basic requirement and for reasons pointed out above it is also necessary that the site be located in proximity to a good water supply and be capable of either spray or flood irrigation. Second-rate soils can, of course, be built up to the high degree of fertility necessary for vegetables, but this is a costly undertaking and is warranted only where other conditions, such as location in regard to market, make a site particularly suitable. Insofar as home gardens are concerned, the intensive nature of the gardening renders the complete rebuilding of the soil both practicable and profitable.

Loamy soils are most suitable for early crops since their open texture allows rapid drainage of excess water, thus permitting soil preparation and planting of crops immediately after the heavy rains. Later in the year, during the spring and summer seasons, these soils become very dry and hot, however, and are not then so suitable. Soils of heavier type, on the other hand, require a longer period after the rains before they are fit to cultivate and plant, but they retain moisture longer and keep cooler during the dry, hot months. Such soils are, therefore, best suited for main and late crops.

The most suitable soils for vegetables will be found mainly on alluvial flats adjacent to creeks and rivers or in delta lands such as the Burdekin and Don River areas. Such soils are naturally of a high degree of fertility and water is available for irrigation.

Management of the Soil.

Liming.—Within the heavy rainfall area of the north it is found that most of the suitable soils are normally highly acid, due to the heavy leaching of lime by rain. For most vegetable crops this condition is

unsatisfactory and must be corrected by the application of lime in sufficient quantity to bring the soil to a state approaching neutrality. Some of these soils will be found to require an initial dressing of as much as 3 tons per acre of pulverized limestone or processed lime to bring them to the optimum condition. Subsequent applications of about 1 ton per acre every second year will be required to maintain the correct condition.

Acidity is not a general condition of all soils in North Queensland, however. The light rainfall areas are usually exceptions—such as, for instance, the Don delta, the Burdekin delta, Charters Towers and Mareeba districts. In the high rainfall zone there are exceptions also, Mount Quincan and the main maize area on the Atherton Tableland being examples. In such areas lime is not required.

Green Manuring.—One of the most important constituents of a good vegetable soil is its content of freshly decayed organic matter, or humus. This supplies plant food to the crops in a readily available form that can be taken up by the roots of the plants. It is a constituent which is rapidly exhausted from the soil under North Queensland climatic conditions. Quite apart from what may be absorbed by growing crops, the heat of the tropical sun on exposed soil will quickly burn out the humus. Soil investigators working on tropical soils have found that when the soil temperature exceeds about 77 deg. Fahr. the decomposition of humus outpaces its formation. Such a temperature is regularly exceeded in the tropics when the soil lies exposed to the sun. This suggests that as far as possible the soil should be shaded to prevent the burning action and also that the humus content should be replenished as often as possible. To accomplish both these objects, cover crops should be grown and ploughed under whenever land is free of vegetable crops. Normally, it will be found that weed growth springs away rapidly when land is left uncultivated for a few weeks, thus providing a natural cover crop. Such a crop is useful, but its value may be offset to some extent if it reaches maturity and ripens seed before being ploughed under, thereby fouling the land with weed seed.

Undoubtedly, the most desirable cover crops are legumes, since most plants of this family have the characteristic of being able to take up nitrogen from the air and hold it in nodules which are developed on the roots. A good leguminous cover crop is capable of enriching the soil by upwards of 100 lb. of nitrogen per acre, and since nitrogen is one of the most important of the plant foods the value of such a crop is at once apparent. In nitrogen value, the figure quoted is equivalent to 500 lb. of sulphate of ammonia per acre.

Some thought should be given to the selection of a cover crop plant suitable for the conditions under which it is to be grown. Generally speaking, crops of the cowpea type are most suitable for quick coverage and short-term growth. The most rapidly growing variety is the black cowpea, followed by Poona pea and Groit pea. Crops of longer duration are the giant cowpea and Mauritius bean, but these have the disadvantage of being rather slow in covering the soil, thus giving weeds an opportunity to become established. Weed growth can be checked, however, by planting the cover crop in drills and cultivating during the early stages of growth—or, alternatively, by using a mixture of the quick-growing varieties with the slower, long-term varieties. Under tropical conditions, black cowpea is fit to plough under in about eight weeks, Poona and Groit

peas in about ten weeks, and giant cowpea in twelve to sixteen weeks. Mauritius bean takes about twenty weeks to produce its maximum growth. The quick-growing varieties are more succulent than the long-term ones but are susceptible to damping-off when grown during the humid wet season weather. This is particularly the case in the high rainfall area. An alternative crop that has found considerable favour in recent years in tropical areas is one or other of the crotalarias. These are upright-growing, shrubby plants of a woody nature, which may be ploughed under in from three to five months after planting. Three varieties have given satisfactory results in North Queensland, viz.:—*C. anagyroides* (the giant crotalaria), *C. goreensis* (the Gambia pea), and *C. usaramoensis*. The crotalarias have one disadvantage—they have small, hard seeds that will only give good germination when planted on a well-prepared seed bed and supplied with ample moisture. As the normal planting season is the storm period there is always a certain amount of risk either that a heavy storm will spoil the seed bed or that the weather will remain dry so long that the seed bed will dry out and so prevent germination.

The cover crop fits into the crop rotation during the wet season months. At this period of the year it will not displace cash vegetable crops since very few vegetables can be grown during these months. The objective, then, for this period should be to have the land sown down during the storm season to one of the legumes listed above. It will not only enrich the soil but will also smother weed growth and prevent soil erosion during the heavy rains, after which it is turned under as green manure. On lands subject to flooding it is most essential to grow a cover crop in the wet season to conserve the soil.

Farmyard Manuring.—Soil-building practices additional to cover cropping or green manuring can also be profitably undertaken. Chief of these is farmyard manuring. Unfortunately, in these days of mechanical power many farmers have no supplies of dung available, but anyone having access to a supply is strongly recommended to make full use of it. In some parts of America dressings of 50 tons or more per acre are applied regularly to vegetable soils of a light, sandy nature. Whilst such large amounts are not available here to the majority of vegetable-growers, quantities up to 8 or 10 tons can frequently be obtained and dressings at even this rate per acre are extremely valuable. Where a green manure crop is grown for ploughing under at the end of the wet season the manure dressing may be applied in the early spring before a green vegetable crop.

Throughout the northern coastal area there are certain portions of land so located on the banks of creeks or rivers that each year they are covered by flood waters. Where the location is such that the flooding is only in the nature of a backwater, heavy deposits of silt are dropped on the land. The silt usually forms a rich addition to the soil. Unfortunately, quantities of weed seed are also frequently deposited. Land so situated, therefore, often requires more cultivation to control weed growth than lands not subject to flooding.

Preparing the Seed Bed.—The proper preparation of the land is one of the most important factors in successful vegetable-growing, and it is the operation that is most frequently unsatisfactorily performed. Too often land is roughly turned over in large clods with a disc plough

and superficially raked over with light harrows, which only break down the surface to more or less level condition and leave the clods underneath. Then, to make matters worse, seed is planted before the green cover that was turned under has rotted down. Such methods foredoom a crop to failure.

The correct tillage of the soil is dependent upon the use of suitable implements in an efficient manner and at the right time. The type of soil largely decides the implements to be used, but in most tropical soils the following will be found necessary:—(a) a good plough, preferably of mould-board type, that will turn the soil to a depth of 9 to 12 inches; (b) disc cultivators; and (c) harrows. If the soil is of a type that tends to break up in a lumpy condition or remains in a very open state after working, then a cultipacker will also be necessary.

The general farming practice in most northern areas has been to use a disc plough. However, such an implement, which has a cutting action, is not considered so satisfactory as a mould-board plough, with its shearing and crumbling action, in preparing soil. A disc plough can only be considered a satisfactory implement for out-of-season ploughing. In vegetable-farming there is no excuse for ploughing when soils are not in ploughable condition, hence there is no reason for using the less desirable type of plough. Many mould-board ploughs available to farmers in the past have certainly not been of the high class material and construction necessary to give good results. Unscientifically designed mould-boards, with a rough finished surface, have been found not only to fail to turn the soil but to clog themselves within a few yards, to the utter discouragement of the user. However, this is only a condemnation of the individual plough, not of the principle involved in the operation of the mould-board plough. In failing to achieve satisfactory results with a mould-board plough the farmer should not at once blame the plough, because the fault may lie in his own lack of skill in deciding whether the soil is in ploughable condition. If the furrow turns over with a greasy surface to its cut edge it is an indication that the soil is too wet. If, on the other hand, the soil turns out in hard clods and fine, dusty particles it indicates insufficient moisture. There is a simple test as to the fitness of soil for ploughing. It consists in taking a handful of the earth and pressing it together tightly to form a lump. The soil is in fit condition if the lump readily crumbles under light pressure of the fingers. If it will not form a lump the soil is too dry and, on the other hand, if the lump will not crumble readily but tends to stick together then the soil is too wet. When ploughed at the correct stage of moisture content the furrow will turn readily without clogging the plough and the soil will crumble freely. The land should be ploughed as deeply as possible without bringing the subsoil to the surface. On good vegetable soils there should be ample depth of top soil, but even where the subsoil is within 6 or 7 inches of the surface the depth of fertile soil can be gradually increased by ploughing slightly deeper each year, thus mixing small amounts of subsoil with the productive top soil but in such small quantities as to be not injurious to the crops. In this way the subsoil can be gradually mellowed and the depth of fertile feeding soil increased. The use of soils as shallow as 6 to 7 inches is not recommended, however.

If the land carries a heavy cover crop great assistance in turning this under can be obtained by first using the disc cultivator to chop it up.

Cultivators of the cut-away disc type are most satisfactory for this purpose as the indentations in the discs catch and hold the green crop for chopping up as the discs revolve.

Disc cultivators should be run over the land immediately after ploughing and again within a week or two to destroy any young weed growth. After allowing sufficient time for the green crop to rot down—a matter of only two or three weeks in warm weather with plenty of soil moisture—the land should be cross-ploughed, disc-cultivated and cross-cultivated, and finally harrowed down for planting. Harrows may be of disc or peg type. One of the disc type now gaining some prominence consists essentially of sets of small discs set close together and combined with a levelling board.

Cultivators and harrows should be used sufficiently on the land to reduce it to fine seed bed tilth. The final harrowing should be closely followed by the planting. If for any reason planting is delayed then the soil should be again harrowed immediately before the planting.

Whether planting is to be undertaken on the flat or on ridges is largely dependent on the type of irrigation to be practised. If spray irrigation is available then flat planting should be the general rule. Under tropical temperatures flat planting is desirable because drying out of the soil is slower than in ridge planting—also, inter-row cultivation is simplified. Ridge planting is advisable, however, during the tropical wet season on account of the quicker draining of excess moisture. Ridge planting is also desirable if the soil is shallow, since the throwing up of beds gives greater depth of fertile soil. The same type of planting is necessary when flood or furrow irrigation is practised. If ridge planting is to be undertaken the ridges may be either narrow, single-row ridges, or wider beds capable of holding two, three, or more rows closely spaced. Single-row ridges are more suitable for transplanted crops or for hand-sown seeds than for machine sowing.

Spacing of rows is a matter about which there is considerable diversion of opinion. There is no hard and fast rule for row spacing. Whilst it must be varied somewhat for various crops, each farmer must be guided by his own conditions. The rule should be to plant at distances to suit the farmer's cultivation implements. This is desirable because it is essential to do as much of the cultural work as possible with machinery and eliminate unnecessary hand work. In this connection, special vegetable-growing machinery is now becoming available as attachments for both small garden tractors and larger field tractors. This embraces adjustable multiple row planters, fertilizer droppers, and inter-row cultivating implements. This standardised machinery does much to simplify all the operations in row crops. In using this machinery, however, care must be taken to treat each set of rows planted as a group and to carry out all the operations on the one group. Each row is accurately spaced from each other row in the one group, but slight irregularities always occur in the distances between the outer rows of adjoining groups. If subsequent cultivation or other work overlaps rows in two groups there is danger of destruction of the plants or other unsatisfactory performance of the operations. Whatever the type of implement used for planting, the rows should be made as straight as possible.

[TO BE CONTINUED.]

PLANT PROTECTION

Five Minor Fungous and Virus Diseases of Citrus.

F. W. BLACKFORD, Assistant Research Officer.

THE four major fungous diseases of citrus were discussed in the December, 1943, issue of this Journal, and citrus fruit rots and blemishes were dealt with in last month's issue. Five other citrus diseases, namely, collar rot, Armillaria root rot, Ganoderma root rot, psorosis, and pink disease are now discussed; they are all of less importance than the diseases dealt with in December, but they are nevertheless capable of appreciably adversely affecting the productivity of the orchard if their control is neglected. All but psorosis, which is caused by a virus infection, are fungous diseases.

ROOT AND COLLAR ROT.

There is a definite set of symptoms which indicates disorders of the root or collar in citrus trees. An affected tree shows signs of unthriftiness which may sometimes be confined, particularly in the early stages of the trouble, to a single limb. The leaves of an affected tree develop a paler-green colour than is normal in citrus foliage, and finally turn yellow; there is also a considerable amount of dieback, so that the tree becomes very stag-headed. The young shoots which appear on it are small, and instead of developing a healthy, dark-green colour they are yellow and eventually die back. Another symptom is heavy leaf-fall, and a tree very soon presents a thin, ragged appearance. Blossoming may be very heavy, and an unusually large number of undersized fruit is frequently set. Such are the symptoms common to all root and collar rots in citrus; in many cases, however, but more particularly in the early stages of the development of the trouble, these symptoms may be confined to one or to only a few branches.

If the trunk of an affected tree is examined at about ground level it may be found that there are darkened areas of bark from which gum is exuding, and that the bark has lifted and cracked and is fairly easily peeled off. If these symptoms are present, the disease is known as collar rot, a trouble which is very prevalent in lemons grown in coastal districts. It is caused by several species of fungi which may gain entrance to the tree through wounds such as occur when chipping or as a result of sprays, especially those containing oil, running down the trunk and collecting at the base of the tree. Shallow soils, particularly those overlying clay and subject to water logging, are very conducive to the incidence of the disease.

If the collar seems healthy, examination must proceed further to include the root system. Such an examination occasionally discloses the presence of black, string-like structures (Plate 46) pressed close to the bark of some of the roots. These structures, suggestive of shoe-laces, are a stage in the development of a fungus, known as *Armillaria*, which attacks the roots. The bark on attacked roots is inclined to shred, and such roots, if broken across, are found to give off a mushroom-like odour. In advanced cases of attack, a cottony, or somewhat thin, felt-like fungus may develop under the bark. In wet weather, clusters of honey-coloured toadstools packed tightly together may appear at the base of an attacked tree; these are the spore-bearing bodies of the fungus.

Recently another type of fungus, *Ganoderma*, has been found attacking citrus roots and killing trees. A noteworthy feature of *Ganoderma* attack is the fact that the layer of soil which is in immediate contact with the bark of the roots adheres very tightly to it, and indeed appears to form a sheath round the roots (Plate 46). The bark itself is thoroughly permeated by the fungus and readily falls from the woody core of the root. No shoe-lace structures are present, but if the adhering soil is carefully removed with the outer layer of the bark, a creamy, woolly growth of fungus is found on the inner layers. A mushroom-like odour emanates from the dead and decaying roots.

Both these fungi, *Armillaria* and *Ganoderma*, have been found living in rotting tree stumps and roots left in the ground when the land was cleared. In Queensland, *Ganoderma* has been found on old

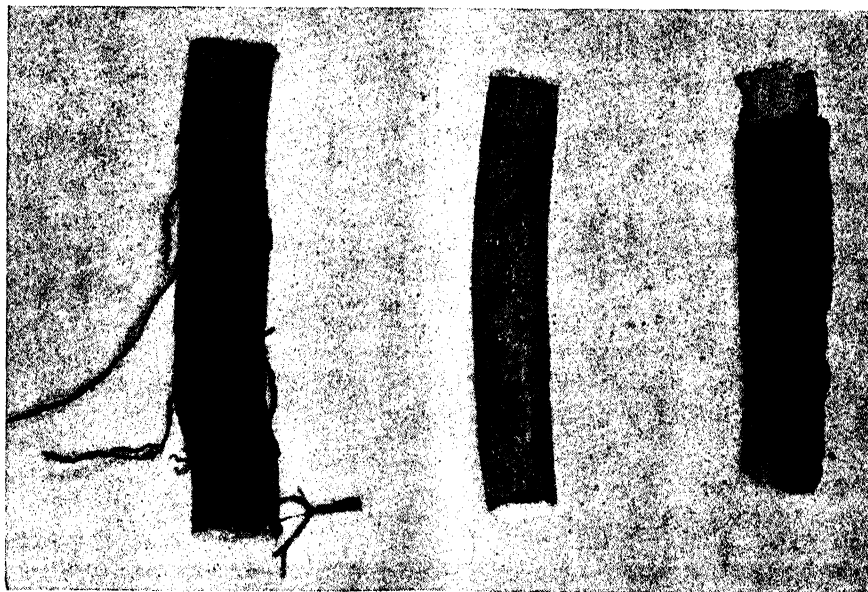


Plate 46.

CITRUS ROOT ROTS.

Left: *Armillaria* "shoe-laces" growing on a lemon root.

Centre: Healthy lemon root.

Right: Lemon root rotted by *Ganoderma*. Note the soil-encrusted bark broken away from the woody core.

bloodwood and ironbark stumps. From such rotting stumps the fungi are able to reach out and attack citrus roots on trees growing nearby.

Control.

Prevention of infection is all important in these three diseases. To guard against *Armillaria* and *Ganoderma*, it is essential that the land be well cleared in the first instance, and, if possible, sown to a green manure or other annual crop for twelve months or so before planting the trees; such a pre-planting interval gives the native tree roots a chance to decay.

Should any one of these diseases appear in the citrus orchard, the soil should be dug away for a distance of about 2 feet from the butt of affected trees, thus exposing the main roots to the influence of the sun and the air, which, in mildly-affected cases, kills out the exposed fungus. Badly-affected and dead roots should be cut away and the surface tissue scraped well back into healthy tissue to ensure that all bark and wood infected by the fungus, but not as yet showing visible symptoms, are removed. These scraped surfaces should then be painted with Bordeaux paint to prevent reinfection. The butts and main roots may be left exposed for several months, but should be covered again with soil before frosts are likely to occur. In the case of *Armillaria* and *Ganoderma* every effort should be made to locate and remove the stump which is the source of the fungus.

A soil treatment with carbon bisulphide, after the removal of an affected tree with as many of its roots as is possible, is now being recommended in California for the control of *Armillaria*. This control measure is rather expensive, but growers may care to give it a trial if only a few trees are involved. Holes about 2 inches in diameter and 18 inches apart in a diamond pattern are made in the soil in which the trees were growing; these holes are made to a depth of 6 to 8 inches by means of a crowbar, the work being done when the soil is dry. Two fluid ounces of carbon bisulphide are poured into each hole, which is then sealed with soil and tamped down. The surface of the soil to a depth of 2 inches may then be moistened with water and the area covered with bags to retain the fumes. In the immediate vicinity of the position previously occupied by the butt and large roots of the tree, however, the dosage rate must be doubled and the holes deepened. An area treated in this manner may be replanted six to eight weeks after treatment. Growers may also care to test this Californian control recommendation in the case of *Ganoderma*.

PSOROSIS.

Citrus psorosis has now been shown to be due to an infection by a virus. On young leaves of an affected tree a mosaic-like mottling is produced by many elongated, light-coloured streaks. These may disappear as the leaf ages, and, at any time, are difficult to recognise, as it is easy to confuse them with the mottling produced by other adverse factors. The symptoms of the disease most familiar to orchardists are those appearing on the trunk and main limbs of an affected tree. Small, raised, pimply areas are formed on the bark which lifts and cracks to form small scales (Plate 47). Eventually the deeper layers of the bark and wood are affected and discoloured, and, at times, there is a small exudation of gum. At first the scaling of the bark is restricted to small, localised areas, but it may spread very slowly to involve large areas

on the trunk and main limbs. Psorosis infection produces weak twig growth and some dieback and hence an affected tree becomes somewhat stunted.

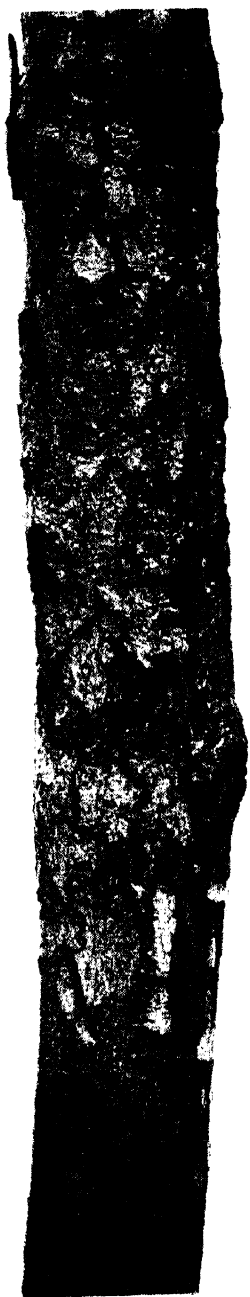


Plate 47.
PSOROSIS.

An advanced stage showing extensive bark scaling.

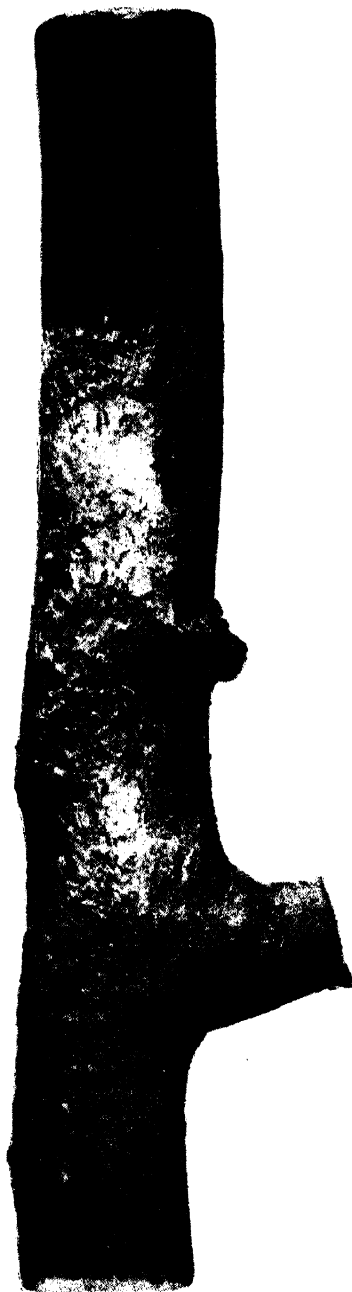


Plate 48.
PINK DISEASE.

A branch showing cobweb-like growth of fungus.

Control.

Because of its virus nature this disease may be transferred from affected to healthy trees by means of buds used for propagation purposes in the nursery. It is therefore essential to select budwood from trees which are free from any typical leaf mottling or scaling bark.

If a tree shows signs of having become infected and the bark is beginning to scale, its life may be lengthened by scraping the diseased bark to just below the green layer and painting the scraped area with Bordeaux paint or lime sulphur, the latter being used at a strength of 1 part of concentrated lime sulphur solution to 6 parts of water. The area which is scraped should extend 6 inches or so beyond any scaly lesions so as to include tissue which has been invaded by the virus but has not developed symptoms. A tree so treated will then develop fresh bark to cover the scraped surface, but a watch should be kept for any reappearance of symptoms. Should that occur further treatment is called for.









PINK DISEASE.

While pink disease may be found in South Queensland it is most prevalent in the wetter districts in the northern parts of the State. The first observable symptom of this disease is the wilting and final death of a small branch. On close examination it is found that, especially in wet weather, a cobweb-like, white, or salmon-pink coloured, fungus (Plate 48) has grown over the bark of the branch, often completely girdling it, and causing the bark to lift and crack. This fungus may spread along such an affected branch, finally infecting the main framework and killing large portions of the tree.

Control.

Once it is known that pink disease is present, infected branches should be pruned out. The pruning cut must be made a little below any observed fungus or cracked bark as a portion of the wood may be infected by the advancing fungus without any symptoms being visible. All pruning cuts should be painted with Bordeaux paint or tar to prevent reinfection, and all prunings burned to destroy the fungus and any spores which may be present. Trees so treated should be examined periodically to make certain that the diseased wood has been completely removed.

WIRE GAUGES.

		Yards per cwt. Iron-Steel
No. 8		566 546
No. 9		695 675
No. 10		882 854
No. 12		1,333 1,293
No. 14		2,240 2,186
No. 16		3,500 3,426
No. 17		4,667 4,462
No. 18		6,222 6,073



Milk Quality.

O. ST. J. KENT.

WE are living in abnormal times, when conditions on dairy farms are made more difficult through lack of materials, shortage of manpower and the like. In spite of this, the milk suppliers to Brisbane have done a good job in providing milk of satisfactory quality over the war years; but there is evidence that the strain is beginning to tell, and it is becoming increasingly difficult for them to maintain the quality that is so desirable for a city trade.

The development of the milk industry will go hand in hand with quality. The better the quality of the milk and the greater faith the consuming public has in its milk supply, the sooner will the industry speed ahead and the per capita consumption increase. Quality must be maintained and improved at all costs. The following notes are therefore given to aid farmers in their efforts to produce milk of the best possible quality.

Health of Cow.

The health of the cow is of first importance. A cow which suffers from disease gives abnormal milk, and every effort should be made to find out which cows are normal and which are not, and to keep the milk from abnormal ones out of the bulk. Milk from cows suffering from mastitis is unsatisfactory and should not be forwarded with the normal supply. It is not always possible for farmers to determine which cows are affected with mastitis, but this may be found by laboratory examination of samples from individual cows, and the Department is willing to arrange for this to be done on request. Mastitis in milk has been found to be the cause of many a sample being degraded by the methylene blue tests, and in those cases where the farmer has eliminated the milk from mastitis cows the quality has always improved. The diseases such as tuberculosis and contagious abortion are the insidious ones which call for some national scheme of eradication, so that the farmer and the nation will benefit. Whilst our herds remain untested there is no argument against pasteurisation of milk.

The Cleansing of Utensils.

This item has been given priority next to the health of the cow because unclean utensils have been found responsible for the poor

keeping quality of many samples of milk examined. This is not only the experience of Queensland, but it is the experience of all other dairying countries. There are many reasons why trouble is found with utensils, and some of these are listed below.

- (a) Inadequate supply of water at the bails and dairy.
- (b) Lack of proper facilities for washing, scalding, and/or sterilising equipment.
- (c) Use of incorrect methods.
- (d) Inexperienced labour.
- (e) Carelessness.
- (f) Dusty surroundings.

(a) *Inadequate Water Supply.*—Utensils cannot be cleaned without water, and yet on some farms a supply of water at the bails or dairy house has been one of the last things considered. It is appreciated that in some districts the water problem is much more difficult than in others, but when one embarks on the production of a foodstuff so delicate as milk, it is necessary that provision should be made for its production under the best possible conditions. Water is essential not only for the cleansing of utensils, but for the cleansing of floors, washing of udders, cooling of milk, and for the washing of hands of milkers.

(b) *Lack of Facilities for Cleansing Utensils.*—Very often the uncleanliness of utensils is the result of an insufficient supply of boiling water. Cases are still reported of farmers carrying a kettle or kerosene tin of water from the house to the dairy house to do a job that requires 12 or more gallons of boiling water. It is necessary that the boiling water should be right on the spot, and in sufficient quantity to cleanse and sterilise the utensils on hand. A boiler holding 12 gallons is the minimum for any farm, and where machines are used, or a large number of cows are being hand milked, a steam steriliser is a good investment. Accessories, such as brushes and cleansing soda compounds, are not so easy to procure now, but they are necessary to do good work.

(c) *Use of Incorrect Methods in Cleansing.*—Cleansing of utensils involves three simple steps—

- (i.) Rinse with cold or luke-warm water very soon after milking is finished.
- (ii.) Cleanse with aid of brushes and hot water to which washing-soda or other suitable cleansing compound has been added.
- (iii.) Scald with boiling water and allow to dry. If a steam steriliser is available a steaming for five minutes at this stage will make a more thorough job of it.

Even on farms where ample boiling water is available it is not always used to the best advantage. For example, cans and buckets are often taken through the first two steps, but are not given a final treatment with boiling water. At other times, the boiling water that is available for scalding is all put into one can, and from this it goes to the next can, and so on. The first can is well sterilised, but the heat treatment of the others diminishes as the water passes on. It is better to give each piece of equipment a rinse with a smaller amount of water that is definitely at boiling point.

(d) *Inexperienced Labour*.—Nowadays difficulties in securing good men for dairy farms are great. The necessity for strict cleanliness in all matters relating to milk, and particularly in regard to cleaning of utensils, should be impressed on all new hands right from the start. In view of the importance of clean utensils in relation to quality, it is better for the farmer himself to do the cleansing jobs until he is satisfied that his assistant has had sufficient training to do the work for him. Washing up is too often made the Cinderella job on the farm, whereas it is one of the items that need expert attention if best results are to be achieved.

(e) *Carelessness*.—Most farmers take a pride in their work and do what they consider to be the right thing about the cleansing of utensils. Sometimes a farmer may overlook some factor which will cause him trouble, but the careful and conscientious man will invariably experience little trouble over a long period. It is the careless man who usually strikes the most trouble, the individual who skimps over his work, and hopes for the best. They are to be found in all districts, and usually blame everything and everybody but themselves. Dairying is a business which calls for everything to be done to schedule and in a proper manner.

(f) *Dusty Surroundings*.—A lot of good work may be undone if clean utensils are stored so that they become contaminated with dust. It is essential before using utensils that they should be rinsed just before milking. This is best done with a sterilising compound of the chlorine (hypochlorite) type or with water that has been previously boiled and allowed to cool. This rinsing before milking is very important, and should apply to buckets, cans, cooler, strainer, vats, milking machines, and any other piece of equipment with which milk comes in contact. It is equally important that every effort should be made to keep down the dust nuisance. The daily removal of fresh manure, before it is trampled to dust, will keep the yards clean and help in this direction.

Cooling of Milk.

Milk will keep longer if it is cooled, but in Queensland in summer time it is not always possible to achieve any great degree of cooling unless a refrigerator is available. The best one can hope for is a temperature within a degree or two of the cooling water. Cooling should be carried out on all farms, and if sufficient water is available the tubular or wash-board type of cooler should be used. The bee-hive type of cooler is at the best only an aerating device, and unless it is kept thoroughly clean and in sound condition may do more harm than good. Refrigeration is the only sound method of cooling in a sub-tropical country, and the time is visualised in the not-too-distant future when electricity will be available to all dairy farms, and refrigerators a common commodity. It will then be unnecessary for dairymen to milk cows at midnight to please a fastidious public. Cows will be milked at reasonable hours, morning and afternoon, and the milk chilled and delivered once a day.

The cooling of milk, particularly by refrigeration, should not be used to mask unsatisfactory cleansing methods. Cleanliness and proper methods of cleansing are the most important factors in quality milk production, with cooling as an added safeguard against quick deterioration.

Transport of Milk.

Milk is a perishable product with a relatively short life. Its journey from the farm to the factory or the consumer should therefore be a

quick one, and every care should be taken to preserve the quality of the milk on that journey. Trucks should be well covered, as exposure of cans to the hot blazing sun will soon lower the quality of milk. Milk that requires to be transported long distances to market must necessarily be properly cooled, and in Brisbane the time appears to be fast approaching when milk will have to be cooled at suitable receiving depots before being despatched to the city from country centres.

Experiments are being conducted at present in the Dairy Research Laboratory to find out how milk quality is affected by transport under existing conditions.

Other Factors.

In addition to the factors discussed above there are many others which the dairyman has to watch to produce milk of satisfactory quality. The cleansing of udders, removal of fore milk, maintenance of bails and yards in a clean condition, removal of feed remnants from dairy, straining of milk and similar items, all have their place in the daily routine, and their importance has been stressed on many occasions.

Laboratory Tests.

The milk supplied to the Brisbane market under the Milk Supply Act is controlled by laboratory tests. The methylene blue test and the Babcock test are used for checking up on quality, and in the case of unsatisfactory supplies a detailed microscopical examination is made, and farmers are notified of the findings. The laboratory control has played a big part in maintaining the quality of milk, and has rendered the farmers a service in helping them to improve conditions on the farm and in eliminating unsatisfactory animals. Reports sent out from the laboratory should be taken as advice notes, primarily sent to the farmer to indicate to him that something is amiss. The prudent dairyman acts on the advice given, and very often calls at the laboratory to discuss his problems with the technical officers.

In Queensland, at present, payment for milk at most depots is made without regard to the butter-fat content or the bacteriological quality. The time must soon come when all milk is paid for on a basis of quality, both chemical and bacteriological, and then a rapid advance in the quality of milk will become evident.

Cottage Cheese.

O. ST. J. KENT.

THIS is a soft cheese made from skim or separated milk. On farms and in households there is usually a surplus quantity of skim milk which is too often thrown to waste. The making of cottage cheese offers an economical way of using skim milk, and will also help the housewife to solve the problem of meat rationing, since cheese is a food which is rich in protein.

In making cottage cheese the utensils required are few. An enamel or tinned-steel bucket or other suitable vessel may be used for setting the skim-milk. Other requirements are a square piece of cheese cloth, fairly coarse textured, a long-bladed knife, a spoon, and a thermometer.

A gallon of skim-milk will give about 1½ pounds of cottage cheese.

How to Make the Cheese.

Place one gallon of freshly-skimmed milk into the vessel, and bring to a temperature between 70 degrees and 80 degrees Fahr. Add a cup of sour milk and allow to set in a clean, warm place until the milk has coagulated (see notes below). When the curd is fairly firm, it is cut with the knife into cubes with the sides from 1 to 2 inches long. The whey will now start to separate from the curds, and after stirring gently with a spoon for five minutes, the temperature should be raised to 100 degrees Fahr. and maintained at that mark for half an hour. (Heating is probably best carried out by placing the vessel containing the curds and whey into a vat or small tub containing hot water, the temperature of which is suitably adjusted.) The curds and whey are then poured onto the cheese cloth, which is tied to form a bag by taking up the four corners and fastening with string. The bag is then hung up to drain. The whey soon drains out and when it stops draining freely the curd is emptied into a dish, worked into a smooth paste, and salt is added to suit one's taste. An ounce of salt is approximately the amount required when 1 gallon of milk is used.

If cream is available, the flavour and texture of the cheese will be improved by adding a tablespoonful of fresh cream at the time of salting.

The cheese may be eaten immediately it is made, and is preferably eaten fresh. It should not be kept more than a day or two, and should be stored in a cool place until used.

Explanatory Notes.

The coagulation of the milk is brought about by the action of lactic-acid bacteria, which develop naturally in milk and produce lactic acid. The milk will coagulate itself if allowed to stand long enough, but may at times take as long as twenty-four or thirty hours. It is therefore preferable to add a cupful of sour milk to the gallon of skim milk, as this shortens the setting period to twelve or eighteen hours. The milk if set at night time will be ready for cutting next morning. This sour milk should have a clean, sharp lactic-acid flavour, otherwise the flavour of the cheese will be impaired. Such sour milk is known as a starter.

Starters specially prepared from lactic cultures are used by all cheese factories from which they could no doubt be procured if desired. They will also be posted to any address for the nominal fee of 1s. 6d. upon application to the Dairy Research Laboratory, Brisbane. Freshly-skimmed milk is the best to use, otherwise undesirable flavours may be found in the cheese.

Cleanliness should be observed as in the preparation of other dairy products if best results are to be achieved.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to the Department of Agriculture and Stock, Brisbane, without delay.



The PIG FARM

Grain-feeding of Pigs.

E. J. SHELTON.

BACON is wanted urgently and in large quantities. The logical method of increasing production is to either use more grain—especially wheat, which is being made available at a cost that should be payable to pig-raisers—or pollard. There should be enough margin between the price of bacon and the cost of feed to allow the dairy-farmer pig-raiser to carry, at least, as many pigs as he can handle, and even to expand to the level where the pigs are receiving 1 gallon of milk a head and all the grain and pasture they will eat.

Grain-feeders who have no milk should use meat meal. All who feed grain in large quantities can, with advantage, limit the maximum amount to 4 lb. a day when the pigs reach that level of consumption, or even up to 6 lb. for sows that have weaned large litters and need building up again.

In fact, if more bacon is to be produced, more grain feeding will be essential. This is true for the dairying districts, where pigs have hitherto been fed largely on skim milk, and for other pig-raising areas. The use of grain along with skim milk increases the number of pigs that can be produced. If the maximum quantity of grain required to balance the milk be used the bacon-producing capacity of the available milk supplies could be increased almost sevenfold.

The profitable feeding of grain calls for—

- (1) Continuous and adequate supplies of grain;
- (2) Grain at a reasonable and stable price.

Bagged wheat is now available in 10 ton truck lots at 3s. 6 $\frac{3}{4}$ d. per bushel at purchaser's siding if purchased through the State Wheat Board, Toowoomba. Smaller quantities would cost 3s. 9d. to 4s. per bushel. If required, the Board would supply full particulars and advise regarding payment and freight.

The "best" grain is that which shows the greatest profit. Wheat and barley can be used throughout the life of a pig. Maize is a good grain for the early stages but at present values does not compare favourably with wheat. Oats carry too much husk to be fed as the only grain; they should not form more than one-quarter of the total weight of grain fed. The best buying among the grains can be worked out by dividing the price of each *per bushel* by the following figures:—Wheat and maize, divide by 43; barley, 36; oats, 24; the cheapest is that which gives the lowest "answer." At present prices, wheat is the

best buying. Since wheat and maize have the same value *per bushel* for feeding purposes, those who grow their own maize may find it more profitable, when maize is dear, to sell their maize and buy wheat.

Cereal grains are better ground to a coarse meal than fed whole. The saving in feeding value is usually sufficient to pay for the cost of grinding. Barley and oats are improved so much that it definitely pays to grind them before feeding, the nutritive value being increased by about one-eighth; in other words, when wheat costs 3s. 6d. the improvement by grinding is about equal to the usual charge for grinding—6d. per bushel. Those who can do the grinding themselves at lower cost and have the labour to handle it will find it worth-while to grind the grain they use.

When wheat is fed to pigs through a self-feeder, the improvement by grinding is only one-sixteenth—an improvement of 2½d. when wheat costs 3s. 6d. Pigs fed whole wheat appear to waste a lot, as judged by the amount of whole grain that passes through them undigested.

Soaking is not nearly as good as grinding; in fact, recent work indicates that soaking slightly lowers the feeding value of the whole grain meal and there is no advantage in soaking.

In general, there is no payable advantage in cooking any of the cereal grains—grain sorghum meal included—for pig feeding.

Feeds to go with Grain.

Grain alone does not give the most profitable return. It should be fed along with skim milk or, if no milk is available, with meat meal, pasture, or lucerne chaff or hay and a mineral mixture.

On the dairy farm where skim milk is available, the amount of grain used will depend on the amount of milk and green food available per pig. The man with abundant milk and few pigs will not feed as much grain as the man with only a limited quantity of milk per pig. Where grain is being largely used, 1 gallon of skim milk per pig daily throughout the fattening period will give satisfactory results.

On pig-farms where no milk is available, the place of milk can be taken by meat meal and the mineral mixture. A suitable mineral mixture is four parts of ground limestone (carbonate of lime) to one part of salt.

Grain feed is a very necessary supplement to all pig rations.

Supplies of meat meal are limited, and inquiry should be made and orders placed in ample time before the food is required.

The Working Margin in Grain Feeding.

(a) *On the Dairy Farm.*—The position on the dairy farm raising pigs is not simple. The skim milk supply is not constant. Man-power and accommodation are more likely to decide how many pigs can be kept rather than the maximum number that could be produced from the milk, plus a full supplement of grain. The new fixed prices for bacon and grain should allow a dairy-farmer to feed up to the maximum—that is 1 gallon of milk per pig, plus grain—if he has sufficient labour and accommodation. If he has not enough labour or accommodation and the pigs obtain more than 1 gallon a day, he does not need to feed so much grain to satisfy the pig's appetite.

Under this system he still has at least as great a working margin over the cost of feed as when using the maximum of grain.

(b) *Where no Milk is Available.*—On the farm where no milk is available, the usual guide is the quantity of feed that the pigs can eat. One precaution is necessary, however. The new prices allow pigs to be carried up to 200 lb. dressed weight without penalty. Most pigs, if fed to the limit of their appetites throughout, would be excessively fat at such a finishing weight. The safer way is to feed the pigs all they will clean up until they are eating 4 lb. of their grain mixture a day and not to give them any more than 6 lb. thereafter, plus succulent grazing throughout.

If, therefore, the pig-raiser has sufficient labour and accommodation, the prices of bacon and grain should give him a working margin—and a payable one, at that—provided he raises sufficient pigs and raises his own pigs and does not have to depend on the regular purchase of store pigs. It is equally true that the production and utilisation on the farm of the whole of the food supply is the real secret of success, plus good management.

PREPARATION OF GRAIN FOR FEEDING.

Some grains are better ground than fed whole. Maize does not need to be ground for pigs. The saving in feeding value is usually insufficient to pay for the cost of grinding. Barley and oats are improved so much that it usually pays to grind them before feeding.

Wheat does not show such a marked improvement from grinding, though it is often profitable. The nutritive value is increased by about one-eighth; in other words, when wheat costs 3s. 6d. the improvement by grinding is about equal to the usual charge for grinding—6d. per bushel. Those who can do the grinding themselves at lower cost and have the labour to handle it will find it worth-while to grind the wheat.

When wheat is fed to pigs through a self-feeder, the improvement by grinding is only one-sixteenth—an improvement of 2½d. when wheat costs 3s. 6d. Pigs fed whole wheat appear to waste a lot, as judged by the amount of whole grain that passes through them undigested. The actual loss is much less than it appears to be.

Soaking is not nearly as good as grinding; in fact, recent work indicates that soaking slightly lowers the feeding value of the whole wheat.

It is an advantage, however, to moisten finely ground grain to prevent it being blown out of troughs or scattered too widely for the pigs to pick it up; but this moistening to make the particles cling to each other can best be done at feeding time.

POLLARD AND BRAN.

Increased supplies of pollard and bran will be available shortly. How do they compare with grain? Bran contains too much fibre to be used in large quantities for pigs; it is better kept for dairy cows. Pollard, however, is not far below ground wheat in feeding value. At equal prices per ton, ground wheat is the better buying.

APPLIED BOTANY

Edible Trees and Shrubs.

W. D. FRANCIS, Botanist.

4. THE MULGA.*

THE mulga is one of the most important fodder trees in Australia. Conditions which contribute to its importance are its palatability to cattle and sheep and its wide distribution in the inland parts of Australia.

The very large group of plants popularly known as wattles includes the mulga. It has already been pointed out in this series of articles † that the wattles are leguminous trees or shrubs, which are most strongly developed numerically in Australia and Africa.



Plate 49.

MULGA SCRUB ON DYNEVOR DOWNS, BETWEEN THARGOMINDAH AND EULO,
SOUTH-WESTERN QUEENSLAND.

—From negative by S. T. Blake.

* *Acacia aneura*.

† This Journal, vol. 57, p. 214, Oct., 1943.



Plate 50.

MULGA SCRUB NEAR CHARLEVILLE, SOUTH WESTERN QUEENSLAND.

—From negative by S T Blake

Next to the gum trees or eucalypts, the wattles are the chief group of trees in open forests in Australia. The eucalypts are generally dominant in the open forests of coastal areas. The wattles are, as a rule, the commonest trees in the far inland and drier parts. Mostly, the wattles are smaller in stature than the gum trees.

The grey appearance of the leaves and branchlets of the mulga is caused by a covering of fine white hairs. In most places where the trees are accessible to stock they show signs of trimming. This trimming by stock often gives a striking appearance to the trees. In some places they are eaten back at the top so that all the growth is trimmed to a limit of about 5 feet. Constant feeding off prevents the upward extension of the branches. In other cases, the trees are trimmed from below. In these cases all of the growth is removed from the ground upwards to a uniform height of 6 or 7 feet. The large-scale effects brought about by trimming strikingly demonstrate the palatability of the tree.

The mulga is mostly a small tree. Its height varies according to the rainfall of the area. In some areas where the rainfall exceeds 20 inches per year the trees, when not trimmed by stock, attain over 30 feet in height. In drier areas the height is reduced to 15 or 20 feet. The branches are mostly ascending. The leaves are situated alternately on the branchlets. In shape, the leaves are narrow—2.4 inches long, $\frac{1}{8}$ to $\frac{1}{4}$ inch in width. Occasionally, they are seen to be striate. The flowers are borne in yellow spikes in the forks of the leaves, the spikes measuring from $\frac{1}{4}$ to $1\frac{1}{2}$ inch long. The flowers are followed by the pods, which are flattened, and measure from $\frac{1}{2}$ to $1\frac{1}{2}$ inch long and from $\frac{1}{4}$ to $\frac{1}{2}$ inch broad.

In many parts of inland Australia the mulga forms extensive forests or "scrubs."

In Queensland it occurs mainly in the south-western portion. It is found as far east as St. George, in the Maranoa District, and as far west as the borders of South Australia and the Northern Territory. Jundah is about the northern limit of the more extensive forests. Occasional patches are met with farther north, to the west of Winton.

It is also abundant in South Australia and the Northern Territory and extends into Western Australia.

The photographs which illustrate this article are from negatives by Mr. S. T. Blake, to whom appreciative acknowledgment is made.

ANSWERS.

(Selected from the Government Botanist's outward mail.)

Paterson's Curse.

Inquirer (Murgon)—

The specimen is Paterson's Curse or Blue Weed (*Echium plantagineum*) which is fairly common in some parts of the Darling Downs, but is more abundant in the southern States than in Queensland. It is especially abundant in South Australia, where it covers acres of wheat land and is popularly known as Salvation Jane.

It has been gazetted a noxious weed throughout Queensland, but seems to spread rather slowly. It is not known to possess any poisonous or harmful properties, but has no particular virtues, except that in some districts it has a good reputation as a honey and pollen plant.

Burr Trefoil or Medic Burr.

J.T. (Mt. Larecom)—

The specimen is the Burr Trefoil or Medic Burr (*Medicago denticulata*), one of the best of the winter legumes grown in Queensland. The plant is best sown about April or May, grows during the winter and spring months and dies out on the approach of hot weather about October or early November. At that time of the year the plant is a mass of little pods which are nutritious and readily eaten by stock.

The plant is more abundant on the Downs country than on the coast, and the only disadvantage it possesses there is that the burrs become matted in the belly wool of sheep.

Tumbling Mustard.

D.C. (Toogoolawah)—

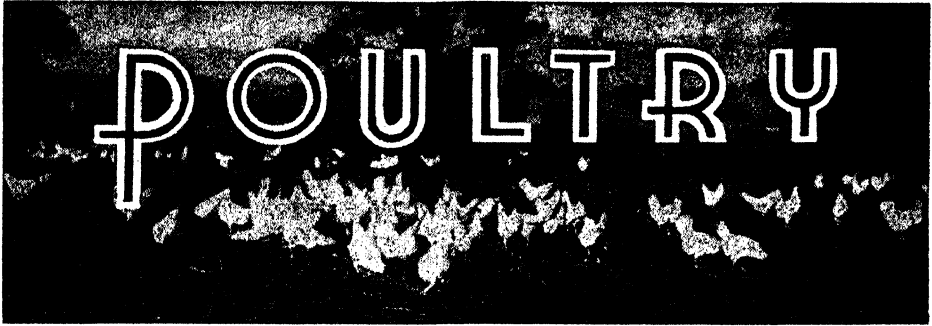
The specimen is the Tumbling Mustard (*Sisymbrium orientale*), a fairly common weed in cultivation in south-eastern Queensland. Like other members of the Mustard or Turnip Family (*Cruciferae*), it taints milk rather badly if cows happen to feed on it.

Bind Weed.

C.K. (Rohedale)—

The specimen is the Bind Weed (*Convolvulus arvensis*), a very serious pest in the southern States and in recent years has made its appearance on the Darling Downs, where it has spread slowly, but surely and more rapidly during the past couple of years.

It is a most serious pest because it produces white underground runners every part of which when broken with a spade, plough or other implement is capable of forming a fresh plant. It has not made its appearance so far as I know on the coast before, and there is hope that the hot summer on the coast may kill it out. In the meantime, every endeavour should be made to keep down the green growing portion of the plant, so that the white underground runners will eventually become exhausted.



Selecting the Breeders.

P. RUMBALL, Poultry Expert.

POULTRY raisers have been asked to increase the output of eggs. If enough material for building were available, this would not be very difficult. Consequently, in present circumstances, the utmost care should be exercised by farmers in the selection of their breeding stock to ensure that, as far as practicable, every chicken hatched will be reared to maturity. Let the health of the breeding flock, therefore, be a principal point in poultry keeping, for without this sound chickens cannot be expected, and from sound chickens come future healthy flocks. Breeders, therefore, should be selected for constitutional vigour.

The Healthy Hen.

Constitutional vigour may be recognised by a study of various characters. The first-class of characters may be termed general habits; and the second, body type and conformation.

The sound hen will be scratching, dusting, feeding, or singing, and taking an intelligent interest in its surroundings, while the hen of poor constitution will probably be upon the perch or standing about and looking sleepy.

A sound rooster is a frequent crower, attentive to the hens, and pugnacious, while displaying the same intelligent interest in his surroundings as the healthy hen.

Among young chickens and growing stock, disease of a contagious nature may cause the birds to look dejected and unthrifty. It is foolish to think that when the trouble abates the condition will be corrected. Some will undoubtedly improve, but culling should, nevertheless, be particularly severe.

Body Characteristics.

Body shape and size indicate largely vigour and physical expression of health. Attitude also indicates health. The poor bird has not the alert stand and movement of the sound fowl. A healthy bird shows indications of good digestion capacity and normal development in a relatively long, broad back, deep body, prominent breast, full abdomen and crop, and moderately long keel. In other words, the bird has length, depth, and width of body. A bird of low vitality is the reverse. A

good illustration of the two extremes between high and low vitality may be observed from the way in which birds of high and low vitality fill in a rectangle. The most pronounced features in comparison are the shallow body, breast, and tucked-up abdomen. Size of shank and bone size are factors also of the poor type of bird easy of comparison. The high vitality bird is compact and blocky, while one of low vitality is loose-jointed, spindly, and of a stilty type.

Poultry are not always uniform in shape. Cockerels may appear stilty, but they will invariably, if they possess vigour, have a rugged appearance. Hens, when laying, are much fuller in the abdomen than during the moulting period, and may have a shrunken appearance. They will, however, have the breast development, and there will be no alteration in length and width of back. Again, the long, thin beak and head, long, thin neck, long, slender body, thighs, shanks, and toes go with the bird of poor vitality, while the reverse is the case with the well-conditioned bird.

The muscular development of a bird also should not be overlooked. It frequently happens that a bird with the framework and feathers of a reasonably good-appearing bird disappoints on handling. Immediately an experienced farmer catches hold of such a bird he becomes aware of a lack of firmness. Examination will indicate a lack of muscular development on breast and thighs, and that the back is poorly fleshed. In such cases the eyes and face may be sunken and lids partly closed. A bird of vigour should have a bright face as compared with either a sunken or fat, sluggish-looking face.

The eye reflects the general health of a bird. Brightness indicates health, and dullness the lack of it. Eyes standing out prominently indicate the healthy condition of the controlling muscles, while the sunken eye with lids partially closed suggests the lack of muscular development.

Size and weight should also be taken into consideration. The biggest and heaviest bird is not necessarily the soundest. Breed and strain have to be considered. Some big-framed birds are not always the heaviest because of lack of muscular development; and, again, their larger appearance may be due to feathers. It is generally good practice to class the smaller and lighter birds in a flock as the weaker constitutionally. They will invariably be found to be excessively fine in bone, and, although fair producers, undesirable breeders. Again, the exceptionally large birds of a flock will usually run to the extreme of coarseness.

There appears to be a definite correlation between the shape of the body and the head. On an excessively long-bodied bird will be found a long, fine neck, a long head and beak, and sunken eyes (crow-headed), while the bird with a solid compact, blocky body has a short, thick neck with a broad, round head and short, heavy curved beak.

Large, bright-coloured soft comb and wattle may be expected with the healthy strong bird. They are a reliable indication of health. The comb condition alters with lay. The comb and the bright red face of the bird are a better indication of health than production.

The large, wide-open, expressive, bright, round eyes, as compared with the sleepy, dull, and sunken eyes, are very important features in judging vitality.

ANIMAL HEALTH

Tetanus in Livestock.

MARSHALL R. IRVING.

DEATHS of livestock caused by tetanus ("lockjaw") occur sporadically throughout Queensland, and mostly of the more valuable animals because of their greater predisposition through more frequent handling and contact with the common sources of infection. As tetanus is now a wholly preventable disease, it is surprising how few stockowners avail themselves, at small cost, of the modern scientific facilities for avoiding all risk of losses in livestock from this fairly common and very fatal disease.

The Commonwealth Serum Laboratories, Melbourne, have had for some years now two important products on the market for use in the *prevention* of tetanus. Their limited use by stockowners is mainly because of the fact that few owners are aware of their existence, or of the very high degree of protection they afford to animals which have been or may be exposed to infection by tetanus germs.

Veterinary Tetanus Antitoxin.

The first of these products is veterinary tetanus antitoxin. This product has been in use for many years, and its chief veterinary value is the protection of animals against a possible occurrence of tetanus following injury or surgical operation. The degree of protection afforded by the antitoxin is high if given within twenty-four hours before or after injury or operation; but *the duration of this protection is limited to two to three weeks only*. In persistent wounds it is possible for an animal to die from tetanus after the protection of the antitoxin has faded.

Tetanus Toxoid.

The second and more valuable product for the prevention of tetanus is tetanus toxoid. This is a more recent development and was first available for veterinary use in Australia just before the outbreak of the present war. This is a vaccine and is *capable of producing in animals an active immunity to tetanus which lasts for life*. It is not suitable for administration for immediate protection of animals after injury or operation, as it takes two weeks to develop its maximum immunity. It should, therefore, be given at least two weeks before a contemplated operation. The immunity produced by the toxoid is very high, and the risk of tetanus in vaccinated animals following immunisation with it is practically eliminated. The advantages of vaccination with this product will surely appeal to owners of all livestock, particularly stud cattle, saddle horses, and stud sheep, in which losses from tetanus occur more frequently. The cost of this protection is negligible, and the trouble involved is the least one could expect for such a satisfactory result.

In view of the very fatal nature of tetanus and the little hope attending attempts at treatment once the disease has become established, the more general use of preventive vaccination with toxoid is strongly urged. It is ironical that an owner may spend many pounds on serum in a forlorn hope of saving a favourite saddle horse or stud bull which has contracted the disease and with very little prospect of success, while the same amount spent on the toxoid would have ensured the protection of his whole herd for many years.

Both products are injected by the ordinary hypodermic syringe under the skin, and the following are the doses and costs:—

1. *Veterinary Tetanus Antitoxin* (to give a two to three weeks' immunity to tetanus following injury or operation).

Doses—Horses—500 units (U.S.A.).

Cattle—500 units (U.S.A.).

Sheep—100 units (U.S.A.).

				Price.	
Available in bottles as follows:—				s.	d.
1 bottle containing	500 units (U.S.A.)	..	..	1	6
1 bottle containing	1,000 units (U.S.A.)	..	..	2	6
1 bottle containing	1,500 units (U.S.A.)	..	..	3	6
1 bottle containing	5,000 units (U.S.A.)	..	..	7	9
1 bottle containing	10,000 units (U.S.A.)	..	..	14	6

2. *Veterinary Tetanus Toxoid* (to give a life-long immunity commencing two weeks after injection).

Doses—Horses—10 c.c.

Cattle—10 c.c.

Sheep—1 c.c.

				Price.	
Available in bottles as follows:—				s.	d.
1 bottle containing	10 c.c.	..	..	1	3
1 bottle containing	250 c.c.	..	..	22	6

Both products can be obtained from the Commonwealth Health Laboratory at Brisbane, Toowoomba, Rockhampton, Townsville, and Cairns, or direct from the Commonwealth Serum Laboratories, Parkville, Victoria.

Sunflower Poisoning.

MARSHALL R. IRVING.

IN December serious mortality in travelling sheep occurred on the Darling Downs, the cause of which proved to be the Wild Sunflower (*Verbesina encelioides*), sometimes known also as Crown Beard. Of a mob of 1,290 merino weaners carrying seven months wool deaths totalling about 320, or 25 per cent., occurred within two days following an exposure to a patch of Sunflower for a few minutes only.

The history of the case is as follows:—

The weaners were mustered one evening and started on the road the following morning. During this first day they travelled 12½ miles

to camping yards over fairly good feed, except during the last couple of miles. They were watered at sundown and yarded for the night. Next morning, on breaking camp at daybreak, they strung along a bare stock route to the first gate about $1\frac{1}{2}$ miles away. At the gate was about an acre of Wild Sunflower growing in profusion, and when inspected a few days later this crop was found to have been well trimmed by the mob. The Sunflower was in all stages of growth, from small seedlings to flowering plants about 2 feet high.

Passing through the gate the mob moved another $5\frac{1}{2}$ miles over fairly good feed to a bare, dry lunch camp without mishap. After a three hours spell the sheep moved off again, and had gone only three-quarters of a mile when trouble started.

The first symptoms noted by the drover were the heads depressed, a stiffness or paralysis of the forequarters, staggering, and about forty head started to go down. The mob was pulled up for one and a-half hours, and when they moved again sixty were left prostrate and forty staggered along behind the mob.

By sundown on the second day the sheep had covered only 3 miles from the lunch camp and over 100 had been dropped. The prostrate sheep held their heads firmly round on their sides, struggled frequently to rise, showed marked respiratory distress and frothing from the nose, and were quite paralysed in the forequarters.

By next morning over 100 weaners had died, 200 were prostrate, and over half the remainder showed symptoms of sickness. All healthy and "walking-sick" were put into an adjacent paddock.

By sundown on the third day deaths had reached 170, and continued through the night until they ceased the next day with a total of over 300. Signs of recovery appeared on this fourth day, and within three days little signs of sickness were visible in the survivors.

Post-mortem examination by the owner showed only congestion of the lungs and blood-stained faeces in the lower bowel. Attempts at treatment with hypo solution only accelerated death, and it was found that forcing sick sheep to move caused more to go down.

This is characteristic of poisoning by Sunflower. The best course is to leave sick sheep undisturbed, and most will recover. Attempts at treatment or forcing the sheep to move only accelerate death and increase the mortality.

Although other poisonous plants were found on the stock route, there is no doubt that the Wild Sunflower was the cause of the mortality.

Description of Wild Sunflower (Verbesina encelioides).—The plant may be described as a small edition of the common garden sunflower, having the same erect stem, pale-green, hairy leaves, and a bright-yellow sunflower head up to 2 inches in diameter. The plant grows to about 2 feet in height and is fairly common on the Western Darling Downs and Maranoa districts. Its chief danger is to travelling stock and it is not usually eaten by paddocked sheep.

LIVESTOCK GESTATION TABLE.

The figures in the first column indicate the times of service, and those in the others the dates on which the animals of the respective breeds are due to produce their young.

Time of Service.	Sows 114 Days.	Cows 283 Days.	Mares 340 Days.	Ewes 150 Days.
January 1	April 24	Oct. 10	Dec. 6	May 30
January 6	April 29	Oct. 15	Dec. 11	June 4
January 11	May 4	Oct. 20	Dec. 16	June 9
January 16	May 9	Oct. 25	Dec. 21	June 14
January 21	May 14	Oct. 30	Dec. 26	June 19
January 26	May 19	Nov. 4	Dec. 31	June 24
January 31	May 24	Nov. 9	Jan. 5	June 29
February 5	May 29	Nov. 14	Jan. 10	July 4
February 10	June 3	Nov. 19	Jan. 15	July 9
February 15	June 8	Nov. 24	Jan. 20	July 14
February 20	June 13	Nov. 29	Jan. 25	July 19
February 25	June 18	Dec. 4	Jan. 30	July 24
March 2	June 23	Dec. 9	Feb. 3	July 29
March 7	June 28	Dec. 14	Feb. 9	Aug. 3
March 12	July 3	Dec. 19	Feb. 14	Aug. 8
March 17	July 8	Dec. 24	Feb. 19	Aug. 13
March 22	July 13	Dec. 29	Feb. 24	Aug. 18
March 27	July 18	Jan. 3	Mar. 1	Aug. 23
April 1	July 23	Jan. 8	Mar. 6	Aug. 28
April 6	July 28	Jan. 13	Mar. 11	Sept. 3
April 11	Aug. 2	Jan. 18	Mar. 16	Sept. 7
April 16	Aug. 7	Jan. 23	Mar. 21	Sept. 12
April 21	Aug. 12	Jan. 28	Mar. 26	Sept. 17
April 26	Aug. 17	Feb. 2	Mar. 31	Sept. 22
May 1	Aug. 22	Feb. 7	April 5	Sept. 27
May 6	Aug. 27	Feb. 12	April 10	Oct. 2
May 11	Sept. 1	Feb. 17	April 15	Oct. 7
May 16	Sept. 6	Feb. 22	April 20	Oct. 12
May 21	Sept. 11	Feb. 27	April 25	Oct. 17
May 26	Sept. 16	Mar. 4	April 30	Oct. 22
May 31	Sept. 21	Mar. 9	May 5	Oct. 27
June 5	Sept. 26	Mar. 14	May 10	Nov. 1
June 10	Oct. 1	Mar. 19	May 15	Nov. 6
June 15	Oct. 6	Mar. 24	May 20	Nov. 11
June 20	Oct. 11	Mar. 29	May 25	Nov. 16
June 25	Oct. 16	April 3	May 30	Nov. 21
June 30	Oct. 21	April 8	June 4	Nov. 26
July 5	Oct. 26	April 13	June 9	Dec. 1
July 10	Oct. 31	April 18	June 14	Dec. 6
July 15	Nov. 5	April 23	June 19	Dec. 11
July 20	Nov. 10	April 28	June 24	Dec. 16
July 25	Nov. 15	May 3	June 29	Dec. 21
July 30	Nov. 20	May 8	July 4	Dec. 26
August 4	Nov. 25	May 13	July 9	Dec. 31
August 9	Nov. 30	May 18	July 14	Jan. 5
August 14	Dec. 5	May 23	July 19	Jan. 10
August 19	Dec. 10	May 28	July 24	Jan. 15
August 24	Dec. 15	June 2	July 29	Jan. 20
August 29	Dec. 20	June 7	Aug. 3	Jan. 25
September 3	Dec. 25	June 12	Aug. 8	Jan. 30
September 8	Dec. 30	June 17	Aug. 13	Feb. 4
September 13	Jan. 4	June 22	Aug. 18	Feb. 9
September 18	Jan. 9	June 27	Aug. 23	Feb. 14
September 23	Jan. 14	July 2	Aug. 28	Feb. 19
September 28	Jan. 19	July 7	Sept. 2	Feb. 24
October 3	Jan. 24	July 12	Sept. 7	Mar. 1
October 8	Jan. 29	July 17	Sept. 12	Mar. 6
October 13	Feb. 3	July 22	Sept. 17	Mar. 11
October 18	Feb. 8	July 27	Sept. 22	Mar. 16
October 23	Feb. 13	Aug. 1	Sept. 27	Mar. 21
October 28	Feb. 18	Aug. 6	Oct. 2	Mar. 26
November 2	Feb. 23	Aug. 11	Oct. 7	Mar. 31
November 7	Feb. 28	Aug. 16	Oct. 12	April 5
November 12	Mar. 5	Aug. 21	Oct. 17	April 10
November 17	Mar. 10	Aug. 26	Oct. 22	April 15
November 22	Mar. 15	Aug. 31	Oct. 27	April 20
November 27	Mar. 20	Sept. 5	Nov. 1	April 25
December 2	Mar. 25	Sept. 10	Nov. 6	April 30
December 7	Mar. 30	Sept. 15	Nov. 11	May 5
December 12	April 4	Sept. 20	Nov. 16	May 10
December 17	April 9	Sept. 25	Nov. 21	May 15
December 22	April 14	Sept. 30	Nov. 26	May 20
December 27	April 19	Oct. 5	Dec. 1	May 25
December 31	April 23	Oct. 9	Dec. 5	May 29

War Agricultural Committee Notes.

FOLLOWING are extracts from a recent communication from the Federal Ministry of Supply and Shipping:—

The Rubber Position.

The monthly quota of pneumatic tyres and tubes to Queensland is based on exactly the same formula as are supplies to other States; that is to say, the supply made available to each State from time to time is a percentage of the tyres and tubes sold within that State in the basic months of September, October, and November, 1941—the period immediately preceding the Japanese entry into the war. This percentage, of course, does not allow any tyres whatsoever for private purposes, the latter in the main being served with second-hand tyres, retreads, and recaps. In fixing quotas, it was also realised that all forms of rationalisation of transport, pooling of vehicles and community carting, would need to be provided for to the fullest possible extent in order to avoid any serious breakdown of essential transportation.

The importance of the land industries was fully realised, and, largely, the primary producers' priority has been sufficient in most States to ensure that essential vehicles are maintained.

Community Carting.

An examination of the outstanding applications from primary producers disclosed that action taken to institute community carting to the fullest possible extent had been incomplete, many of the applications being from small farmers in districts near to Brisbane and other main towns where community carting is generally quite practicable and satisfactory—it has proved to be so in other States. It is realised, of course, that this would not apply in the case of isolated farms in outlying districts, and also on large stations where certain vehicles are necessary for the upkeep of water bores which must be kept in working order, and it is appreciated that in such cases care must be taken to ensure maintenance of essential vehicles.

Alternative Transportation.

Applicants in localities where regular transport facilities exist have been informed that there were not enough tyres available to satisfy all essential demands and the possibility of some alternative means of transport, such as established carrying services, or horse-drawn vehicles, or the joint use of one vehicle for a number of essential users, should be considered, and in this connection they were asked to collaborate with the local transport authority in their district. Where all means of alternative transportation had been examined and there was no escape from the use of the vehicle in respect of which the application for tyres was made, then the applicant was asked to supply further particulars as to distance from local centres, necessity to make essential visits, and number of journeys a month to the local transport authority for reconsideration and recommendation. Until the result is known specifically, it will be difficult to say just what extra tyres will be really necessary in Queensland; but, because of certain savings and cutting down in other States, it may be possible over the next few months to make available in Queensland additional passenger and commercial utility type tyres in the sizes mainly needed by the farming community. Whilst this will not solve the whole problem, it will at least alleviate the position.

Vigorous action towards pooling and community carting among primary producers would be appreciated, as offering the best prospect of ensuring that really essential tyre requirements are supplied. This has been done to a very large extent in other States, and without it the transport system would have probably broken down because it would not have been—nor is it now—possible to supply all the tyres and tubes required. Community carting in Queensland, therefore, assists materially in easing the tyre position.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Rural Topics

Britain's Wartime Agriculture.

A 70 per cent. increase in the net output from the soil of the United Kingdom, measured in the all-important calories, indicates the important part which British farmers are playing in this war. The increased production has been achieved despite a 2 per cent. reduction in the area of cultivated land. The additional area brought under cultivation by reclamation has been more than offset by the loss of cultivated land to military and industrial use.

The increase has been achieved despite the fall in the number of male agricultural workers. Greatly increased mechanisation of production and the willingness of the remaining workers to work harder has more than compensated for the loss of manpower.

The pattern of British agriculture has been considerably modified. Cereals, potatoes, and crops used for milk production are first priority products. Milk is being produced in record volume.

The acreages of various crops in 1942, expressed as a percentage of pre-war acreages, were:—

	Per Cent.
Wheat	136
Oats	172
Cereals	176
Potatoes	180
Vegetables	185

Imports of animal feeding stuffs have declined from 8.5 million tons pre-war to 1.5 million tons in 1942, with a consequent decline in total livestock numbers. These numbers in 1942, expressed as a percentage of pre-war, were:—

	Per Cent.
Cattle	105
Sheep	82
Pigs	48
Poultry	76

The present trend of opinion in the United Kingdom is in favour of maintaining British agriculture after the war at the present increased production level. This would be facilitated by reversion to agriculture of lands now used by the services, and to a less extent by industry.

The Women's Land Army in the United Kingdom numbered 65,400 at the end of May, 1943.

Producers who have increased their milk sales of 1942-43 by more than 10 per cent. will receive a Diploma from the Ministry of Agriculture of the United Kingdom, reading as follows:—

"This Diploma is awarded to the farmer and farm workers of..... in the County of..... in recognition of their loyal work for their country in its time of need. The milk production of this farm showed an increase of more than.....per cent. over the previous year."

A Home-made Milk Safe.

Here is an idea for a home-made milk safe for keeping milk cool in the warm weather: Take a kerosene tin and cut out the sides, merely leaving the corner pieces for towelling and to hold a water basin on top. Sufficient towelling should be provided to cover the sides entirely, and it should be provided with a draw thread. Wring out the towelling in cold water and place it around the tin and draw the thread tight over the top. Place a basin of water on top of the tin and use strips of towelling to allow the water to reach the covering on the sides. Make a hole at

each corner of the tin and fasten a bit of wire about a foot long through the hole in each corner. Then collect the four wires in the centre and fasten them to a metal ring for a hook to hold the safe. The safe should be hung in a shady and draughty place.

Souring of milk is caused by tiny germs which are always present in the milk. These germs multiply rapidly in warm milk, but their growth is checked if the milk is cold.

Australia Delivers the Goods.

From the outbreak of war to 31st March, 1943, Australia had shipped foodstuffs and beverages worth £208,615,000 to all overseas destinations—to Britain, to other parts of the Empire, and to Allied countries.

Of this total, exports to Britain accounted for £118,698,000, or 56.89 per cent. of all the foodstuffs shipped.

Setting the Plough Right.

Every point in farm economy is important these days, and the proper setting of a plough is one of those points. It has been found that, through faulty setting, the draught of many tractor ploughs in every-day use on farms is as much as 300 lb. weight more than it need be. An extra 150 lb. of draught at ordinary ploughing speed means that the tractor must develop an extra horse-power at the drawbar, and that it will use an extra gallon of fuel a day without useful return. It follows, then, that faulty plough-setting is the cause of many tractors wasting as much as 2 gallons of fuel a day. Not only that, but the ploughing isn't as good as it ought to be. Both fuel wastage and poor ploughing can be avoided by keeping to the simple rules of good ploughing, the first of which is to see that the plough is set right. District agricultural instructors are always ready and willing to give advice on these matters if advice is needed. An experienced neighbour will also, no doubt, gladly help a less-experienced farmer out of any little difficulty in setting a plough right.

Australian Workers Helped a Record British Harvest.

Workers in Australian agricultural machinery plants had a lot to do with making a success of Britain's record harvest of last season, for one out of every five of the hundreds of new binders used in getting in the Old Country's heaviest wheat crop came out of Australian workshops. That is another way, not commonly known, in which we have been happily helping in keeping Britain's bread basket full. As Ruskin wrote, "there are soldiers of the ploughshare as well as soldiers of the sword."

In a remote part of England a combine harvester had not been seen before. One old farm worker, seeing an Australian combine for the first time, thought it was "something for those Army and Air Force boys," but after having the workings of the machine explained to him, said, "Ah, well, it's a grand tool. Likely they'll have one next harvest to turn out a loaf of bread at one end and a bottle o' beer at t'other end!"

Rather optimistic, perhaps, but if a combine were built that way it would certainly solve a storage problem for a harvest festival.

Planning for Rebuilding and Development after the War.

While the first and biggest job is to win the war, it is generally agreed that, without diverting energies from the greatest task, it is necessary to give deep thought to rebuilding and development plans which should take shape before the inevitable post-war problems arise. Two obvious things to do are to prepare the ground for rebuilding and provide for the necessary organisation. That means getting busy on a research programme and on devising the necessary machinery for the working of whatever plans are evolved. In our post-war planning it is important that we should not be handicapped through lack of technical information, through confusion of social and economic values, or through the absence of effective administrative machinery. It is necessary, therefore, to investigate actual or prospective needs in regard to post-war planning, to work out ways and means of meeting those needs, and to consider the setting up of efficient machinery for putting post-war plans into effect. Boiled down, no matter how closely occupied we may be with war-time tasks, we still have to realise the wisdom of preparing for peace. The job of sane, clear thinking, and patient, fearless, unprejudiced exposition of post-war problems demands the co-operation of all.

Our Women Food Producers.

Women on the land will be numbered among the highest contributors to national service when the full story of the war in Australia is presented. On many a farm and grazing property, women and girls have been courageously carrying on the work of essential food production without any thought of glamour ever since the war started. Besides keeping the home fires burning, they have cheerfully and effectively shouldered the burden of farm and pastoral management. Even on the stock routes women drovers are no uncommon sight, and there is scarcely a branch of primary production in which they have not taken a full and competent share. The Country Women's Association can tell of many a farm run entirely by women who, in addition to maintaining their well-organized homes as centres of real culture and looking after young families, are directing and doing all sorts of field work with skill and common sense, as well as finding time in their crowded day to take their part in community affairs. Women of Australia, like women of Britain, are right in the front rank of food producers who are pooling their brains and their resources in a full-powered drive for victory.

The Sting of the "Wasps."

In addition to country women working their own farms, there is the Women's Land Army, a mobile organization ready for service where the need of farm workers is most urgent, and linked with other women's auxiliaries. Among these auxiliaries is the Women's Agricultural Security Production Service, otherwise known as "WASPS," a New South Wales organization whose field of operations is not very far below the Queensland Border. Most of its members are town girls who, on very short notice, go to farms in the surrounding district to help in planting and harvesting crops on which there is always a weather limit. The "WASPS," who put plenty of "sting" into their work, travel out to their voluntary farm jobs and return to their homes each day and so solve one of agriculture's present-day problems—accommodation of emergency farm workers. The assurance the "WASPS" give to the district farmers is "plant what crops the nation wants and we'll guarantee to harvest them."

Front Line Farming in England.

In one English county alone tens of thousands of bombs have landed on the farms, to say nothing of shot-down German planes. Land girls working on these farms have been issued with "tin hats," and some of them have been strafed again and again while driving tractors near the coast, but have never been scared off their job—more evidence of the undefeatability of the spirit of Britain. It also may be evidence, perhaps that the arms of Mars are jealous of the arms of Ceres!—From *Farm Implement and Machinery Review* (England).

A Pig Responsibility.

More than any other animal, the pig depends on his owner for the conditions under which he lives. Dirt isn't the pig's responsibility; it's the responsibility of the man who looks after the pig. It will be many years before we breed pigs capable of cleaning out their own sty and then taking a shower bath without assistance.

Where to Put the Branding Iron.

The greater care now given to the branding of cattle means that we are well on the way towards preventing the enormous loss—said to run into hundreds of thousands of pounds a year in the aggregate—caused by careless and faulty branding—that is, branding on the rump or other valuable parts of the hide, and the use of unnecessarily large brands. At a time like the present, when all forms of waste should be cut out, it goes without saying that the benefit of correct branding will be acknowledged by every cattleman. Correct branding reduces the waste in a hide and so increases its value to the tanner, and, therefore, to the stockowner.

The Goat Becomes Respectable.

In Queensland, especially around mining centres, the goat has long been looked on as a domestic necessity, not only as a milk producer, but also as a "mutton" producer. In Britain, a movement to make the goat more popular as a milk and butter producer has advanced rapidly. Over there the development of goat-breeding from a milk-producing standpoint has resulted in some extraordinary milk yields which have been officially recorded. Small landholders have found it easy to add to the family's rationed food supply by keeping a goat or two for both milk and butter and the cost of maintenance is scarcely worth mentioning.

Bottle-fed Calves.

Getting tired of bucket-feeding his calves and trying to dodge the trouble of breaking them in to drink for themselves, a South Coast dairy farmer has gone back to the old method of rearing poddies on the bottle. He got some quart bottles (empty, of course!) and fills them for every feeding with warm milk fresh from the cows to the quantity required according to the age of the calves. On each bottle an ordinary feeding nipple has been placed. The bottles are suspended in a rack made especially for the purpose, and the poddies are simply left to it.

This farmer finds his bottle-fed calves thrive better than when he had them on the bucket. They soon learn to suck from the bottle, and now always wait around the rack about the regular feeding time. By using bottles an extra ration can be given to each calf, and this saves, not only milk, but the tiresome task of teaching the poddies to drink by the old finger method. Another thing, too—the calves get their nourishment quite normally and it is not gulped. There is no chance of a dirty hand being plunged into the milk, and no spill-over through the calves butting into the feeding bucket. The fly in the ointment, however, is the probable scarcity of rubber nipples these days.

Much of the benefit of bottle-feeding comes from the fact that the milk taken in small quantities passes naturally to the true stomach of the animal and is more easily digested. In bucket-feeding, the milk is gulped so quickly that a lot of it is forced into the poddy's paunch, where it may cause a lot of digestive trouble, leading to scouring and other disorders. Calves should be kept on the bottle until weaning time arrives. During this critical time in a calf's life, a small amount of lime water and sometimes a tablespoonful of cod liver oil (or a wartime substitute) may be added to the milk. The bottles should be kept scrupulously clean, as with any other dairy utensil, and sterilized after each feeding and then left on a rack to dry.

The Kelpie and Heeler—Australian Working Dogs.

The following abridgment of an article by "Canis Major" in the *Australasian* (Melbourne) will interest Queensland sheep and cattle men:—

There is a wide variety among the world's sheep and cattle dogs, but of all the beautiful and useful dogs used few, if any, could excel in sagacity and endurance our Australian dogs, the heeler and the kelpie.

With breeds evolved so recently in our own country, it is surprising that so little is known generally about them. Versions of the breeds used in the production of these dogs differ according to the authority. It is claimed that different types of Scottish working dogs were inter-bred. It is generally agreed that the Scotch collie, not the show-bench variety, but the working type, and a short-haired, prick-eared lurcher, were among the most important of the kelpie's progenitors.

Those who have watched kelpies competing with Border collies in sheep-dog trials at agricultural shows should remember that this tactful working of sheep around obstacles and through gateways is simple work compared with that expected of dogs when droving sheep along stock routes. Uncanny in its intelligence and untiring in its effort, the kelpie may travel anything from 30 to 100 miles, while the sheep cover only 10 miles.

The endurance shown by the kelpie, toiling all day over miles of dry country, shows that it has even greater vitality and fortitude than the Border collie, recognised as the world's best worker of sheep.

A TOUGH WORKER.

Breeders of heelers like telling us that the introduction of dingo blood has had a big influence in providing the heeler with that quiet, subtle cunning that enables it to glide in and out among the hooves of wild heifers and steers without any apparent fear. There is no dog tougher, hardier, more intelligent, or willing to work than our Australian heeler. The dog seems capable of enduring the most prolonged periods of work under the severest conditions.

Most of the work of droving is often done by the dogs. A nip on the heel from the silent heeler brings a speedy return to the track of any would-be strays or stock that might lag behind.

Both kelpies and cattle dogs are active and alert. For their work and to comply with show-ring standards, both breeds must have muscular substance, without any appearance of coarseness. Dogs should measure about 18 inches to 20 inches at the shoulder, and hitches an inch or so less. The coat of the kelpie should be moderately short, flat, smooth, and weather-resisting, with a dense undercoat. Kelpies are black, black-and-tan, red, red-and-tan, fawn, chocolate and smoke-blue.

The heeler should show more muscular development than the kelpie. It has a thick undercoat. The coat should be profuse behind the legs but smooth, straight, and short elsewhere. Colours in the heeler are described as red-speckled and blue-mottled, the latter colour predominating in numbers.

Knots to Know

CHAIN HITCHES.

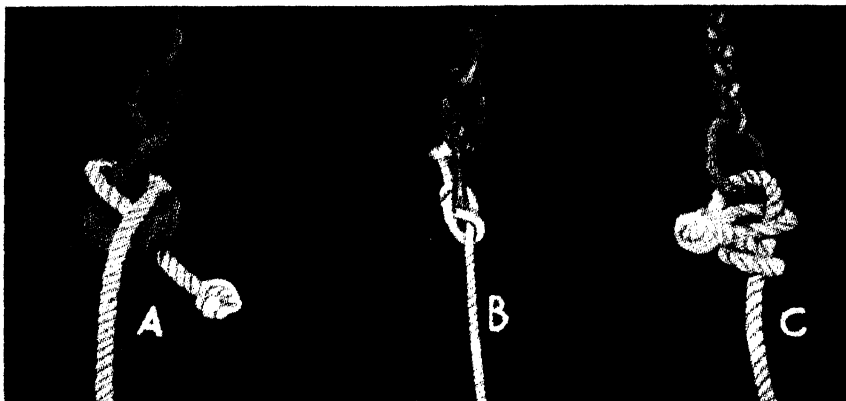


Plate 51.

CHAIN HITCHES.—Three methods.

Where it is required to hitch a rope to a chain, this can be done very simply and expeditiously as in Fig. A.

Fig. B shows a useful hitch for joining a rope to a closed link. This hitch will not slip in use, but it may work loose if the chain is left slack. It is intended chiefly for temporary work. The hitch shown in Fig. C is absolutely slip-proof and is well suited for a permanent join.

CLOVE AND TIMBER HITCHES.

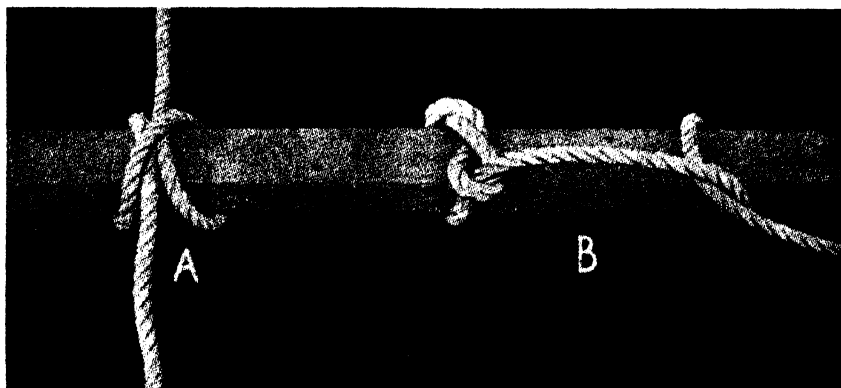


Plate 52.

CLOVE AND TIMBER HITCHES.

Hitches may be very conveniently used for lifting timber, or for holding a strain.

The clove hitch (Plate 52, Fig. A) is very simple and easily applied, but it is liable to slip, particularly if the rope is wet. The timber hitch as shown in Fig. B is safer in use, though rather more difficult to apply. It is commenced by an ordinary hitch as in Fig. A, the short end of the rope being then led some distance along the load when it is turned round to form a hitch, being finally tucked for several turns between the hitch and the load.



Plate 53.
SHEEP SHANK.

ROLLING HITCH.

This is regarded as the safest of all hitches, and is very commonly used for handling round timber. It is also useful for hitching an animal to a post or to a picket line, as in addition to being perfectly secure, it will not slip in any direction—either round or sideways. It can be very easily undone when the strain is removed. (See Plate 54.)

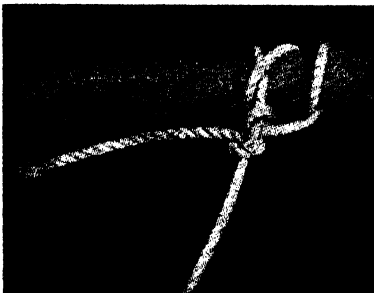


Plate 54.
ROLLING HITCH.

SHEEP SHANK.

This is a variation of the hay knot, and is well suited for shortening a rope without cutting it. It is commenced in the same way as the hay knot, and is completed with a hitch round the bottom of the loop exactly similar to the first hitch at the top (see Plate 53).

The sheep shank will not slip under strain unless either of the ends of the loop is pushed through the hitch. It can be made secure and permanent by hitching the loop ends round the rope.

BOTTLE-NECK HITCH.

This is at times useful when it is required to raise a barrel or tank in a vertical position, as for lifting water or for earthing a stack of silage (see Plate 55).

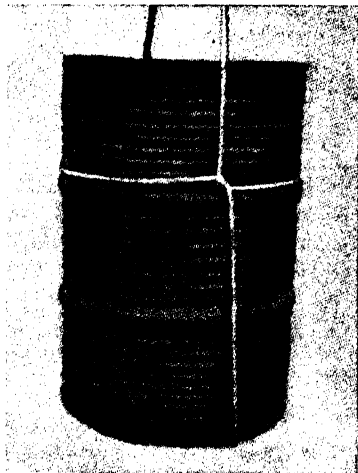


Plate 55.
BOTTLE-NECK HITCH.

GADGETS AND WRINKLES

PULLING POSTS WITH HORSE POWER.

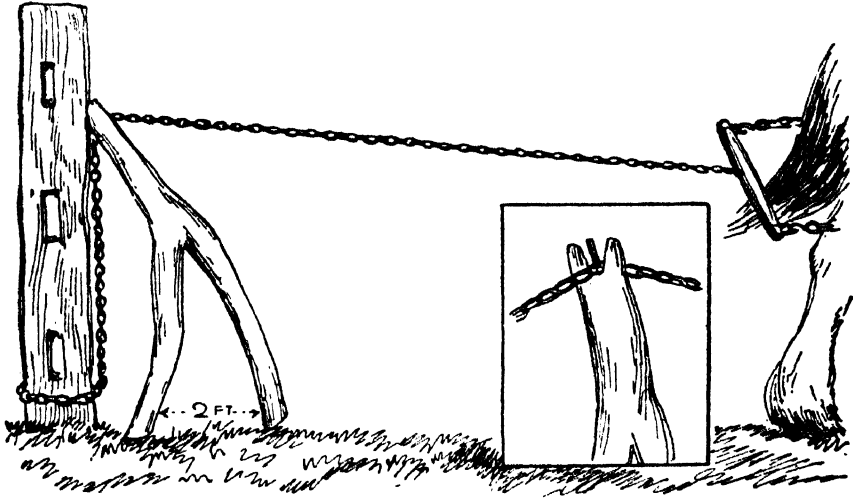


Plate 56.

With this method of pulling out old fence posts, a stout fork, as illustrated, is used as a fulcrum. If it has a bend in it, so much the better. Both legs of the fork should stand firmly on the ground, with the top or shank of the fork leaning against the post to be pulled out. The fork should be about 4 feet long and its prongs with a spread of about 2 feet. The "toe" of each prong should be placed about 2 feet 6 inches from the post at ground level. Each "toe" should be cut at an angle, so that it will "spade" itself into the ground and not slip. In the shank of the fork a V should be cut into the top or tip and a hole bored (see inset detail), so that a pin may be fitted into any link of the chain used for the job. The chain should be pulled as tightly as possible between the turn round the bottom of the post and the V in the shank of the fork, as shown in the sketch. For this method of post pulling, it is claimed that one man with a good, steady draught horse can easily yank out a mile of posts a day.

WATER TRAP FOR MICE.

The sketch at the right illustrates how easily an effective mouse trap can be made. The requirements are a few cotton reels (or cocoa tins with lids on), a short length of stout fencing wire, a board 2 or 3 inches wide and long enough for a ramp or runway leading from the ground to the top of the tin, a short length of thin wire, and a bit of cheese for bait.

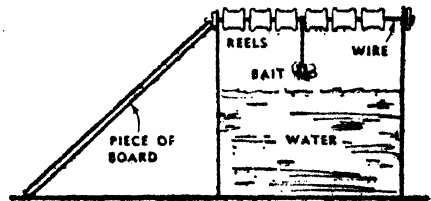


Plate 57.

Holes should be punched through two opposite sides of the tin, then the short length of fencing wire passed through one of the holes, the cotton reels threaded on, and the wire passed through the other hole in the tin. The board for the ramp or runway is placed at an angle (as shown in the sketch). The bait is suspended by the thin wire from the axle. To get at the bait, mice will go up the board on to the reels, to be tipped into water below. A little grease on the wire axle will cause the reels to revolve rapidly. What happens to the mice is obvious.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BABY'S HEALTH: NATION'S WEALTH.

Understanding Children.

FROM birth to the age of five years is a very important period in the development of the emotional life of the child. The feelings of the young child are very intense, his affection very strong, his need of the love and care of parents and others very great. He has neither the experience nor the knowledge to help himself to control his feelings. He is subject to acute fears—fears of animals, of people, of noises, of the dark, and so on. He may wake up or partly wake up screaming with terror without any understandable cause. He may suffer from a breakdown in habits of cleanliness when there is an upset in the home or some change in the surroundings or routine, or when a new baby arrives or some loved person is removed. The young child tries to make his many needs known to those about him, but so often they do not understand, and he finds it hard to hold his own amongst those who are bigger and stronger than himself. It is well for everyone who has the care of young children to realise that behaviour problems due to some emotional experience through which the child is passing are bound to occur and that they should be treated with patience, consideration, and sympathetic understanding. The present is a difficult time for many—families are living in rooms and flats, homes are being shared and the divided control and management of children are producing problems, food has to be called for, mothers with several young children whose husbands are away from home on military or other essential war service are battling along often unaided. All honour is due to those serving on the home front and the following observations and suggestions are made with the view of helping them.

1. An infant is very sensitive to his mother's state of mind. If she is calm, possesses self-control, and handles her baby with patience, understanding, and wisely-directed affection, he is likely to develop a feeling of confidence and contentment and a stable disposition.

2. One person in the home should be responsible for the child's up-bringing, if possible the mother. If both parents are at home, they should agree on the methods employed.

3. Avoid discussing the child in his presence. To retail his funny sayings and doings only makes him self-conscious, unnatural, and less straightforward in his behaviour.

4. A mother should avoid trying to keep her child's affection to herself otherwise she will not only make a rod for her own back, but she will retard the child's healthy development. The child should learn to care for others and enjoy their company.

5. Prepare the children, particularly the youngest child, for the coming of the new baby by trying to interest them in babies and telling them how nice it would be to have a baby of their own. It is extremely upsetting for an eighteen-months-old toddler who has had all the attention to see a little stranger taking his place in his mother's arms. The jealousy of a little child should not be merely considered amusing, for it may have very harmful effects on the development of his character. Therefore, give the toddler a fair share of consideration and attention and teach him to help to care for the new baby.

6. Avoid saying or doing things which it is not desired that children should say or do. Children are clever imitators.

7. Train the child to share with others, to give his brother or sister a portion of what he has, but do not expect too much of him in this way until he reaches the age of three or four years.

8. Avoid "tricking" a child into doing what he is told—to take a spoonful of jam when you know he will dislike the taste of the medicine in it. Still more, do not promise him some treat which it is not intended to give him. Above all, be truthful, otherwise the child cannot be expected to tell the truth.

9. Do not frighten a child into obedience, particularly by threatening him with nasty medicine, with a visit to the doctor, or with sending for the police.

10. Consider carefully the kind of things asked of a child to do or not to do. For example, it would be unreasonable to expect a young child to keep still. If he is doing things he is not wanted to do, provide some other form of occupation. Avoid frustrating him at every turn by continually saying "don't." Once it is decided that a request is reasonable, let the child understand that you mean what you say and expect obedience.

11. Encourage a toddler to do things for himself, for it is in this way that he learns and becomes independent. This often requires time and patience on a parent's part. Be ready to give assistance when he requires it and refrain from saying, "I knew you couldn't," which only tends to make him lose confidence in himself.

12. Encourage a child to face difficulties and difficult situations. For example, if it has been arranged with him to perform an unpleasant task or to keep an unpleasant appointment and, when the time approaches, he complains that he is not feeling well and it is known that he is not really ill, treat him sympathetically by telling him that you are sorry but the task must be carried out or the appointment kept. By all means give him all the assistance and reassurance he needs. In this way you will be helping him to develop courage.

If you have cultivated a spirit of comradeship with your children, you will find them easier to understand and manage.

Questions on this or any other matter concerning Maternal and Child Welfare will be answered by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

CEMENTING BAGGING.

Good weather and windproof barriers can be made by coating bagging or hessian with cement. The material, however, will remain waterproof only if kept in vertical or steeply sloping position. The framework should provide for easy placement of the hessian. The mixture may vary from equal parts of cement and fine sand to three parts cement to one part sand for an especially smooth job. Equal parts of each are ordinarily satisfactory. The sand should be finely sieved. For the final coat, use three of cement to one of sand.

To tighten it should be wetted, and the coat applied with stiff scrubbing brush. After the first coat has dried sufficiently—not too dry—the second coat should be applied. The hessian should be sprayed with water after each coat of cement has been brushed on with whitewash brush. The hessian should be tacked along each edge to uprights. Best results are obtained on a dull day. While drying in warm weather the cemented hessian should be sprayed with water to prevent cracking. If wire netting is stretched across timber under the hessian, a firmer cover will result. Cemented hessian is suitable for roofing, but rafters and purlings should be firm and a final coat of bitumen (if available) is advised.



Plate 58.

STARTING A "DIG FOR VICTORY" GARDEN IN A BRISBANE SUBURB.—These girls, employed in city offices and shops, spend their spare time growing vegetables for military hospitals.



Plate 59.

CONTOUR CULTIVATION.—This terraced garden in a Brisbane suburb is evidence of the enterprise of "Dig for Victory" girls, whose week-end industry produces high yields from hard and stoney ground.

IN THE FARM KITCHEN.

Cream of Tomato Soup.

Wash $1\frac{1}{2}$ lb. tomatoes and cut up roughly. Put in a saucepan with 1 blade of whole mace, 2 cloves, a small minced onion, and 2 bay leaves, salt and pepper to taste, and a pinch of bicarbonate of soda. Cook gently until tender, remove bay leaves, &c., and rub through a fine sieve. Melt 2 dessertspoons butter in a saucepan, add 1 tablespoon plain flour, cook a little, then add 2 pints warm milk. Stir until it thickens and then allow to simmer for 5 minutes. Now add puree and carefully reheat. A little sugar may be added, also a little cream. On no account allow the soup to boil or the soup will curdle.

Medley Stew.

Fry 2 large minced onions in bacon fat until brown, add $\frac{1}{2}$ lb. minced steak, free from fat, and stir all the time while cooking so as to keep particles of meat separate. Add 2 cups cooked spaghetti and 4 sliced and cooked tomatoes. Melt $\frac{1}{2}$ cup grated cheese in 1 medium-size tin tomato soup, add 1 tablespoon any good relish and a little clove of garlic (optional). Add soup, &c., to meat, stir until well blended, adding more salt and pepper if necessary. Serve piping hot with fingers of toast or fried bread.

Savoury Fritters.

Make a mixture as follows:—Place 1 oz. butter in saucepan with $\frac{1}{2}$ cup water and bring to boiling point. When butter is quite melted, add 2 oz. plain flour and stir over gas until it leaves the sides of saucepan clean. Allow to cool a little, then beat in 2 whole eggs, one at a time, and beating well after each egg is added. Add pepper and salt to taste, and, if liked, a little chopped parsley. Drop in dessertspoonfuls in very hot, but not boiling, fat and cook over a moderate gas until well risen, brown, and crisp. Take up and drain. Fill with any left-over meat, vegetable, &c., finely chopped and well flavoured, and mixed with enough sauce to bind mixture together. Make hot before filling puffs, then serve at once with a well-flavoured sauce.

Meat Roly Poly.

Take 4 oz. shredded suet, $\frac{1}{2}$ lb. liver or cold meat, 1 onion, 1 gill water, $\frac{1}{2}$ lb. flour, $\frac{1}{2}$ teaspoon salt, 1 gill gravy or stock.

Chop the liver or meat and onion. Mix with flour, shredded suet and salt. Moisten with the water to make a fairly stiff paste, roll lightly and shape into a roll. Lay roll on a scalded and floured pudding cloth. Roll up in cloth and secure ends tightly. Place in a saucepan of boiling water, and boil for 2 hours. When cooked, remove cloth and serve with the gravy or rich stock heated and poured over. Enough for two or three persons.

Baked Cabbage.

Shred a fairly large cabbage finely and soak in cold salted water until crisp. Drain well and put in a large saucepan with a tablespoon butter, pepper, and salt to taste. Cover well with a tight-fitting lid and cook until tender. Stir now and again during the cooking to prevent burning. Allow to cool, then add 2 well-beaten eggs, 1 tablespoon shredded and fried bacon, a little grated nutmeg. Well grease an ovenproof dish or basin and sprinkle thickly with brown breadcrumbs. Fill centre with the cabbage and cover with more breadcrumbs. Bake in a hot oven for half an hour, turn out and serve with brown sauce or as a vegetable to serve with roast meat.

Baked Rhubarb Pudding.

Stew 1 bunch rhubarb in the usual way, using as little water as possible. Remove the crust from stale white bread and weigh 1 lb. Cover this with just enough milk and when quite soft squeeze out until almost dry. Mix this with 2 oz. finely-grated suet, 2 oz. sugar, and 1 beaten egg. Line a well-greased round cake tin with this mixture, reserving enough for top. Fill with rhubarb, then cover with the remaining bread mixture. Bake in a moderate oven for $1\frac{1}{2}$ hours. Turn out carefully and serve hot.

Steamed Date Pudding.

Butter a pudding basin and line it with stoned dates, pressing them well on to sides of basin. Cream 4 oz. butter with 4 oz. sugar until light and white. Sift 6 oz. plain flour with 1 level teaspoon baking powder and a good pinch of salt. Add 1 unbeaten egg to butter, beat well, then add a little of the flour. Add another egg and beat that well in. Add about 1 dozen chopped dates to remaining flour and add to butter mixture. Lastly, add a little milk to form a dough that will drop from the spoon easily. Put mixture into lined basin, cover with buttered paper, and steam for 2 hours. Turn out carefully and serve with sweet sauce.

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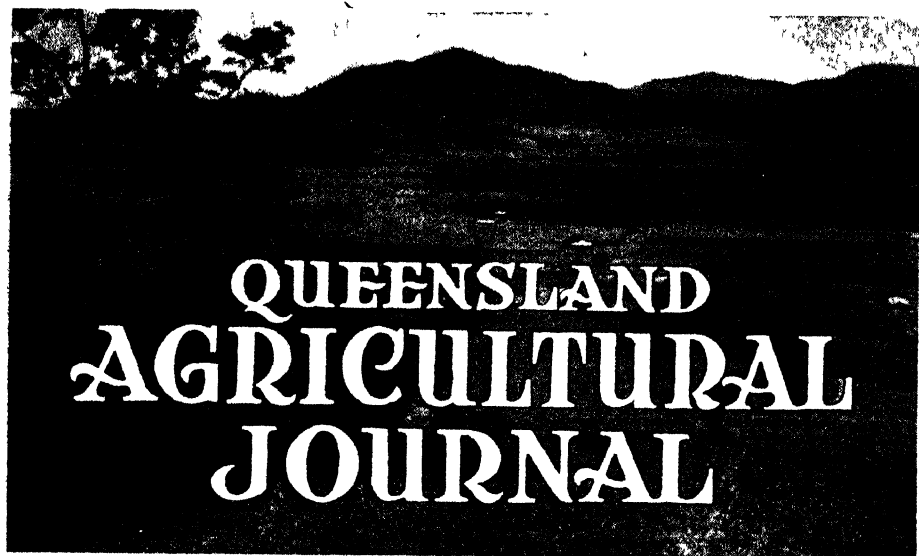


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ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



Volume 58

1 MARCH, 1944

Part 3

Event and Comment.

Australia a Main Food Base.

COMFORTING comparisons with pre-war figures of food production are not enough. The only figures of production worth considering now are the figures which relate to present needs. The need for a bigger output of basic foodstuffs is definitely here.

The developments of the past year have brought this question of adequate food supply to the attention of every authority, and also to those who hitherto have thought of war primarily in terms of fighting forces and their equipment. It is now realised that defence plans must be co-ordinated with agricultural plans. The nation must have food to win the war and have a lot left over to ensure a lasting peace. The very success of our forces in the field increases the demand on the agricultural and pastoral resources of Australia. That demand will be greater yet, if we are to fulfil all our food commitments in regard not only to our Allies and Britain, but to those people of the war-devastated countries who look to us, as well as to other primary producing countries which are still free, to satisfy an ever-gnawing hunger.

The war also has brought out in bold relief the fact that agriculture as an industry is a consumer of goods as well as a producer of food, and that farmers must have these goods in the form of essential equipment and supplies, if they are to produce the food now needed so urgently.

If there is any need which will commend itself to the Australian farmer, it is the need of the people of Britain, and as far as he able he will make sure that Australia's contribution of foodstuffs to the Old Country will be worth while and that no ship shall leave Australia's shores with an empty hold. During the past five years Britain has produced immense quantities of war material of every kind and, at

enormous cost and risk, conveyed it in British vessels conveyed by British warships over the most perilous ocean routes of the world for use in *all* the theatres of war. The men and women making these munitions must be fed, and it is questionable whether they could physically continue their output on less than their present meagre ration. A definite obligation is on the other countries of the British Commonwealth to ensure to Britain a continuous supply of essential foods outside the range of her own extraordinary war production effort. Therefore, the co-operation of all concerned is necessary for the success of the 1944 food production campaign. The rural labour position is being eased, and other farming requirements are being made available so that Australia may continue as one of the food bases of the United Nations.

Advances to Farmers and Graziers.

NEW agricultural legislation, *The Co-ordination of Rural Advances and Agricultural Bank Act*, passed recently by the State Parliament is a measure of much importance to Queensland primary producers. The most important provisions probably are those for an increase in the maximum advance from £1,800 to £5,000; increased advances for the purchase of stock and plant; special advances for irrigation purposes, crop production and fodder conservation; and an extension of the maximum repayment term from 25 years to 35 years, inclusive of an interest-only period up to five years.

When introducing the measure the Premier and Treasurer, the Hon. F. A. Cooper, M.L.A., said that although it would come into operation immediately, it was also part and parcel of the Queensland Government's post-war planning to stimulate greater rural development and to help generally in the wealth production of the State. Interest on all advances made would be at the reduced rates of *four per centum per annum*. Special advances for effecting improvements on more or less undeveloped blocks may be made to the full value of the improvements, to a maximum amount of £1,250. Moreover, special advances, not necessarily secured by first mortgage, may be made for the purchase of stock and equipment. The maximum in each case is as follows:—

Sheep £1,000, beef cattle £1,000, dairy cattle £400, farm horses £100, pigs £100, agricultural machinery and plant (including machinery and plant for fodder conservation) £500, separator and other dairying plant £250, pineapple and banana suckers and/or other seeds and plants for approved purposes £150, grass and fodder crop seed £50.

The new Act also provides for loans up to £500 for crop production and for fodder conservation. The value of irrigation is recognised by a clause authorising assistance up to £750 for the purchase of pumping equipment, pipe lines, and other necessities. The maximum unspecified purposes advance has been increased from £400 to £1,000. The total amount that may be advanced to any one person or on any one farming proposition may not exceed £5,000, inclusive of special advances.

Further information regarding the assistance now available from the Bank for all rural development purposes, release of existing mortgages, or payment of the balance of purchase money may be obtained through either local centres or the General Manager, Box 123B, G.P.O., Brisbane; or on enquiry at the Bank's Brisbane Office, corner of Grey and Melbourne streets, South Brisbane.



Winter and Spring Fodder Crops.

R. E. SOUTTER, Senior Research Officer, L. M. HODGE, Acting Senior Instructor in Cotton Culture, and W. H. BECHTEL, Instructor in Agriculture.

WHEREVER climatic and soil conditions are suitable, the growing of fodder crops during the autumn, winter, and spring months should have an important place in the cropping programme of farmers and the smaller stock owners throughout Queensland. Each year witnesses a decline in milk production in most dairying districts which reaches its peak during one or other of the periods mentioned; there is also a loss of condition in livestock generally throughout most of the State where the animals are either grazed solely on the native pastures or receive only dried forage as a supplementary ration. The one district in which these conditions are not pronounced is the far northern coastal area, where the growth of certain introduced grasses appears to be sufficiently good to enable beef cattle to hold their condition reasonably well throughout the year.

This reduction in the production of milk and its by-products, and the loss of condition in livestock is of the utmost importance in the marketing of animal products, and it affects the incomes of the producers far more than is realised. A beast that has lost condition in winter cannot obtain the full benefit, from the point of view of production, from the highly nutritious first green flush of pasture in the spring. Hence, in the case of the dairy farmer, not only is there a decline in milk production during the period when the cow loses condition, but there is also the loss of the potential production that a cow is capable of yielding when she has been kept in good condition. The situation may be even more serious with the pastoralist, for a beast requires several months to replace lost condition and get back to the rate of increase of weight that the early summer pastures are capable of producing. It is obvious, therefore, that farmers and pastoralists should adopt every practicable measure to reduce the loss of condition in their livestock that normally occurs during the winter and early spring months in most parts of the State.

An examination of the rainfall data for different districts indicates that, except in purely coastal areas, the production of winter-growing grasses and legumes is likely to be satisfactory only in abnormal seasons. The rainfall in the late summer, autumn, and early winter months in more inland districts, while irregular in occurrence and intensity, generally totals enough, however, to allow of the satisfactory production of winter-growing fodders, provided the summer rainfall has been conserved in an early, well-prepared seed bed. It is believed, there-

fore, that all farmers and small stock owners should grow autumn-sown fodder crops for winter and spring grazing. Experiments and the general results obtained on farms in many districts, have shown that a number of varieties of several very suitable crops are available for such a purpose. By having a series of periodic sowings of judiciously selected varieties of these crops on properly prepared seed beds, farmers and stock owners in all sections of the State receiving an annual rainfall of over 22 inches, excepting possibly the inland sections of the northern monsoonal belt, could undoubtedly provide additional profitable winter and early spring grazing for their stock in most years. As the summer rainfall is nearly always ample in these districts to provide a satisfactory growth of summer fodder crops, provision could be made for ample storage of either silage or dry fodders to supplement the growth of winter fodder, and thus normally bring the livestock into summer in good condition.

The incomes of dairymen and the smaller stock owners therefore can be considerably augmented by sowing winter and spring-growing fodder crops for grazing by their stock. The suggestions appearing in this article regarding the growth of such crops in the different districts of the State are discussed under the headings of those applicable to South Queensland, to Central Queensland, and to North Queensland.

A.—IN SOUTH QUEENSLAND.

A careful analysis of the rainfall records extending over half a century serves to show that, generally speaking, the precipitation in South Queensland is somewhat erratic, varying appreciably from one season to another and in the individual seasons as well. The bulk of the rain, even in the best-favoured areas, falls during the summer months, and in nearly all sections of this district during the autumn-winter-spring period, extending from April to the end of September, the conditions frequently tend to be rather dry except that autumn planting rains generally are experienced. Under such conditions, it is very evident that those engaged in the livestock industry, more particularly in dairying and fattening lambs, will have to supplement the feed produced in the natural pastures in order to be wholly successful. This cannot be done entirely by establishing permanent pastures of introduced winter grasses or clovers, and the most successful and profitable course to pursue is to grow temporary winter crops, such as wheat, oats, and barley, for grazing during the winter and spring periods when supplies of feed in the natural pastures are generally unattractive and often depleted. The satisfactory production of these crops over a series of years can be achieved, however, only by a careful and early preparation of land of a suitable nature in the same manner practically as that recommended for the production of a winter cereal grain crop, and the seasonal sowing of the varieties most suited for the locality and purpose intended.

Oats.

The oat is the cereal most extensively used in Queensland for winter grazing, and the variety most generally sown in the southern part of the State is the Algerian. In 1937 there were 135,639 acres of oats sown throughout the State, three-quarters of which consisted of the Algerian variety. Of this area, 123,743 acres were used for grazing purposes only, 4,187 acres were cut for hay, with an estimated average yield of 1.15 tons per acre, and the balance was permitted to mature grain.

Oats have wonderful recuperative properties, and if sown early in the autumn in South Queensland they can be fed down three and even four times in a season, providing favourable conditions are experienced, such as early germination, a sufficiency of moisture, and the occurrence of mild weather late in the winter.

Though oaten hay can be, and is, successfully made in Queensland, the varieties at present in general cultivation are all more or less susceptible to rust, the presence of which, even to a small extent, greatly reduces its value as feed. Consequently, until varieties, more suitable in this and other essential respects, are evolved and are available to the grower, it is doubtful if oaten hay production will show any expansion in South Queensland.

The oat is really a cold-climate crop, and for successful grain production it requires a cooler climate and more rainfall than is generally experienced in the winter in this State. It may be, however, that varieties will be evolved eventually which will incorporate the necessary resistance to rust and diseases generally, with other essential characteristics, that will also allow them to be grown successfully for grain production. There was a period in the wheatgrowing industry in this State when the varieties being grown were no more, if as well, adapted to Queensland conditions than the oats at present sown. As a result of cross-breeding and selection over a number of years, varieties of wheat are now available that possess to a greater or less extent the essentials which allow them to be grown successfully for grain production. Perhaps agricultural history may repeat itself and suitable grain-producing varieties of oats may be evolved for use in this State. At present, however, the oat crop in Queensland is sown primarily for grazing purposes, the acreage devoted to haymaking and grain production constituting only a small proportion of the total.

Other conditions being favourable, oats can be profitably grown on a greater diversity of soil types than either wheat or barley. It is necessary, however, that the soil be in good tilth to produce the best results with oats, and to obtain this condition, frequent and early working is essential, more particularly on the heavier soils.

The sowing period is in no small measure controlled by the condition of the seed-bed, the weather, and the variety selected. For green-feed purposes, it can be said to extend from February up to the middle of June, according to locality. The earlier sowings made up to the end of April are restricted to the slower-growing varieties, such as Algerian and Guyra, whereas the quick-growing ones, represented by Mulga, Belar, and Sunrise, are generally selected for later planting, more particularly in the warmer and drier districts. Some growers make early sowings of the quick-growing varieties with a view to affording their stock a "bite" while the slower-growing ones are reaching a stage suitable for grazing.

The rate of sowing is controlled more or less by the method employed—i.e., drilling or broadcasting, time of sowing, variety, and locality, but, generally speaking, from 40 to 50 lb., if drilled, and 60 lb., when broadcast, will give satisfactory results in the south.

Sowing by means of the drill or combine is the best method to employ, for not only does it save up to one-third of the seed required for broadcasting, but the seed is placed in the soil at an even depth,

safe from the attacks of birds, and, if there is a sufficiency of moisture in the seed-bed, a quick, uniform germination is obtained, with a resultant even growth of crop. When, however, there is no alternative to broadcasting, the seed should be sown after satisfactory rain has fallen on a seed-bed that has been prepared by a tine cultivation which has left the soil surface slightly but evenly ridged. After sowing, a light harrow drawn across the field will cover the seed lying in the slight hollows formed by the tine cultivation.

Perhaps there is no farm crop which calls for greater care in the selection and purchase of seed for sowing than the oat. It is not only wise, but it is really essential to success, to obtain seed supplies from a reputable seed-merchant or other reliable source, so that the variety will be true to name, well threshed, graded, and free from disease, foreign seeds, and extraneous matter. Oats are of such a nature that contamination might readily pass unnoticed, being in some instances very difficult to discern, and nearly impossible in the case of an admixture of some of the varieties grown here.

As already mentioned, in Queensland the Algerian variety is the one that is most extensively sown for green-feed purposes. It is fairly drought resistant, a good stooler, and slow growing, for which reason it has to be sown early. When this is done, the plants are usually well established by the time conditions become drier, which fact in no small measure has gained for it the reputation it has for drought resistance. Though the Algerian variety is grown so extensively for green feed, it is not as palatable as many other varieties, and is susceptible to rust and smut. Sunrise is a very early-maturing variety and, as a result, stools poorly, thus necessitating heavier sowing. It stands feeding-off well and is more palatable than the Algerian. Belar and Mulga have been grown with more or less success in the drier areas of South Queensland, and, being of a quick-maturing habit like Sunrise, they are suitable for sowing late in the season.

Barley.

Barley is a hardy plant that is grown successfully from the tropics to within the Arctic Circle, and is an important crop in North America, Africa, Europe, and parts of Asia, the United States of America alone growing approximately 6,750,000 acres of it annually. It is not now used to any great extent as human food, but is largely used in stock fattening and as a ration for horses. In Australia the grain is utilised chiefly for malting purposes.

There is less demand for barley than for wheat, barley is more affected by wet weather at harvesting, it is more rapidly overgrown by weeds in a wet spring, and it does not lend itself so well to present-day harvesting methods as does wheat; for all these reasons a great expansion in the area under this crop for grain production in Queensland is unlikely in the near future. Compared with wheat and oats, it has a poor root system, for which reason it tends to pull up more readily when being grazed on certain soils and in some seasons. Nevertheless, it provides the earliest green feed of any of the winter cereals, and can be fed off repeatedly if conditions are favourable for regrowth. In wheatgrowing areas, barley should follow a hay crop if grain is to be produced for malting, as the presence of wheat detracts from its value for that purpose. Likewise, an area cropped with barley should be followed by a crop intended for hay or for grazing, as the presence of barley in wheat greatly reduces its value for gristing, and as a result the wheat secures a low classification and correspondingly poor price.

Barley is more exacting in its soil requirements than either oats or wheat, but any moderately rich soil of a friable nature will, when well worked, produce excellent returns under favourable conditions.

The sowing period in South Queensland extends from the end of March until the middle of June. Crops sown during March and April are generally intended for grazing, though in some seasons, when conditions are favourable, some growers permit their crops to mature grain after they have been eaten down once or twice. May and June sowings are usually made for grain production. The rate of sowing when the seed is drilled ranges from 45 to 60 lb. per acre, and when broadcast is about 75 lb. per acre.

Barley has been grown in the Darling Downs section of South Queensland with varying success for a number of years, the chief centre of production being Clifton. In 1937, 5,923 acres of malting barley, yielding an average of 14.28 bushels, and 2,732 acres of other barley, yielding 13.33 bushels per acre, were grown in this area. Only 626 acres of barley were cut for hay, which yielded an average of 1.25 tons, but 11,966 acres of this crop were grown in the State for grazing purposes.

As a result of observations extending over a number of years, the Cape and Skinless varieties are considered the most suitable for green feed purposes. The Cape is a hardy, heavy yielding, dual purpose variety of the six-row type that is sown extensively on the Downs for both feed and grain production. The Skinless variety is an awnless six-row barley which, on being threshed, separates readily from the husk, giving it the appearance of wheat, hence the term "skinless." It is very early and drought resistant, and is suitable for sowing for grain or feed in the drier districts.

Wheat.

Because of its palatability, high nutritive value, and suitability to the climatic conditions of the Darling Downs, the wheat plant is used extensively in dairying and lamb raising in that district to provide winter and spring grazing. An appreciable acreage of wheat is planted each season solely for grazing purposes, and it is also customary for a considerable proportion of the growers to graze, early in the winter, a section of their fields which have been sown primarily for grain production. In seasons when, owing to the continuance of mild conditions, growth is too rapid, the crop may be frosted or lodge at a later stage in its development; to prevent such an unfortunate happening it is essential for the wellbeing of the prospective grain that the crop be grazed before it is too advanced. The wheat crop is thus a valuable asset to the stock raiser.

Whether intended for grazing alone or ultimately for grain production as well, a wheat crop should not be grazed until it is about 6 inches high or until the plants are sufficiently well rooted to prevent their being pulled up when grazed; otherwise the stand may be so seriously damaged as to reduce the yield to an unprofitable level, either for grazing or for grain production. This applies more particularly to the self-mulching types of soil. Furthermore, stock should not be placed in the fields when the soil is in a wet condition.

Where the intention is to permit a crop, after being grazed, to produce grain, sufficient stock, preferably sheep, should be placed on

it to feed it down rapidly, say within a week or ten days, otherwise the rank portions will be left, a preference being shown for the regrowth. This would result in a great deal of irregularity in growth throughout the crop which, in the case of a forward one, would cause unevenness in the date of maturity, thus handicapping harvesting operations.

Care must also be taken, when the crop is intended for grain, not to permit it to become too far advanced before placing the stock on it, otherwise the developing ears, concealed within the stalks, will be eaten off or injured and the crop ruined. To determine whether the stalks are in such an advanced condition that the ears would be eaten if the crop were grazed, sufficient plants should be taken apart to ascertain their state of development. If small ears are found within the stalks it is reasonably certain that grazing will damage the crop.

Where it is desired to plant wheat for early grazing, the Cleveland and Currawa varieties can be recommended as having given outstandingly the best results of any wheats tried in South Queensland. Both of these varieties may be planted as early as the beginning of March on the Eastern Darling Downs. In an ordinary season grazing would be provided from such planting until the end of September, but if it is desired also to obtain a grain crop it is not advisable to graze the wheat after the end of July on the Darling Downs, nor after the end of June in the Maranoa. Owing to the higher temperatures in the late summer, it is not recommended that wheat be sown in the Maranoa prior to the middle of March. The general experience has been that earlier sowings make a spindly growth with much less production of green feed. The Ford, Warren, and Warput varieties are recommended for the March sowings in the Maranoa and for April to mid-May sowings on the Eastern Darling Downs. Cultural operations for a green fodder crop of wheat are similar to those recommended for a grain crop. The recommended rate of sowing is 45 lb. of seed per acre when the seed is drilled, and 60 lb. when it is broadcast.

Certain legumes may be used as winter and spring fodder crops in South Queensland and, in this connection, the reader is referred to a departmental pamphlet, wherein such legumes as field pea and vetches or tares are discussed.

B.—IN CENTRAL QUEENSLAND.

The natural pastures in Central Queensland are normally dry and deficient in nutrients from June to September. The bulk of the native grasses are summer functioning plants, which are susceptible to frost; hence after their annual seeding, which usually takes place in the late summer or autumn, the nutrient values decline sharply, and by the time the frosts have set in, the grasses are mostly of poor feeding value. The winter and early spring rainfall is usually not sufficient for the profitable production of winter growing grasses and clovers, although it is generally enough to promote satisfactory growth of sown crops planted on well prepared summer fallowed seed beds.

It is of the greatest importance, therefore, that the farmer provide other sources of feed for his stock during these months, to maintain the animals in health and productivity. This may be done by making silage; by storing grains, pumpkins, roots, &c., for winter feeding; by making haystacks of both winter and summer grown fodder crops; by spelling

grass paddocks; or by growing crops for winter and spring feeding. It is with the lastmentioned source of feed that the following notes are concerned.

Preparation of Seed-bed.

In the Central District, where soil moisture is the principal crop-limiting factor, careful attention to the details of the preparation of the seed-bed in order to conserve moisture, must be considered as being essential to success.

Heavy falls of rain in that district are followed by dry periods of varying duration in the course of which the soil dries out rapidly. Nevertheless when cultural practices aiming at soil moisture conservation are properly carried out the rainfall is sufficient to render the growing of winter and spring fodder crops practicable, and indeed easy.

For the satisfactory growth of cereals as fodder crops a well prepared firm seed bed is essential in that it enables the seedlings to make proper contact with the moist soil and thus increases the efficiency of their absorption of water and plant foods. The method of preparation of seed-beds that has been found to be satisfactory at the Biloela Research Station over a series of seasons of a highly variable nature, is described in the following paragraphs. It will be noted that such preparation involves the maintenance of a summer fallow.

Ploughing to a depth of 4 or 5 inches should be completed in July if possible; there is usually ample moisture in the surface soil during that month to ensure of a good fallow being prepared. Later, in the normal dry spring, the surface soil dries out rapidly, especially in the heavier soils which are liable to set, and fallows prepared in August may be extremely cloddy. If land ploughed in August has a fair moisture content, a good tilth, however, can be prepared by harrowing each day's ploughing at the end of the day before the clods dry out. Such a tilth will help to reduce the excessive loss of moisture that usually occurs where the land is left in a hard cloddy condition. When heavy land is ploughed in a dry condition in August it is advisable to double disc it after ploughing in order to reduce the clods to such a size that light rains will moisten them sufficiently to permit of a satisfactory tilth being prepared by harrowning.

On the more friable soils which weather down naturally, and particularly on slopes liable to erosion, the land should be left in a rough condition. This ensures better penetration of the early summer rains, and lessens the risk of soil loss. Such soils should always be ploughed and cultivated across the slope, and never up and down. In general, soils of a very friable texture which have dense clay subsoils and are situated on sloping hillsides, as are many of the brigalow scrub soils, are extremely liable to erosion; the establishment of bare fallow thereon during the wet season should therefore be avoided, if possible.

A skim ploughing may be necessary for weed control during the wet season, but it should be avoided by timely surface cultivation where practicable. When necessary, however, the skim ploughing should be as shallow as possible.

Subsequent cultivation is directed towards weed control, and in this respect the maintenance of a summer fallow is not easy. A summer fallow, however, was maintained experimentally for four years at Biloela, and it was found that a twenty-five tine springtooth type

cultivator, fitted with 6-inch duckfeet, was a very efficient implement for the purpose, creating a sufficiently rough but not cloddy surface. In most seasons it was necessary to scarify the fallow once a month from October to February to control weed growth. Harrows were of little practical use for that purpose, as they tended to ride on the high spots, and left the weeds in the hollows, even when weighted.

The maintenance of a clean fallow during the summer months necessitates a prompt cultivation after every important rain storm or rain group to destroy the fresh crop of weeds. When the planting rains occur, a thorough harrowing may be all that is necessary to obtain the fine, clean seed bed required to ensure a quick, even germination.

Crop Rotations in Winter and Spring Fodder Production.

A proper system of rotation, which includes a summer fallow, is essential for the profitable production of winter and spring fodder crops in the Central District. Land ploughed in July or August, following summer cash crops such as cotton, maize, and grain sorghums, and fallowed during the summer, will be in a suitable condition for planting to winter and spring fodder crops between March and June, or even later. Land, on the other hand, which has been allowed to carry a heavy crop of summer weeds or some early spring sown fodder crop until February or thereabouts, before being broken up, will usually yield poor results. Where a winter and spring fodder crop is to follow a crop grown in the previous winter, spring and early summer, it is advisable to plough as early as possible after that crop has been removed in order to ensure a satisfactory absorption of the summer storms. The surface of all summer fallows should be left in a sufficiently rough condition to trap the beating rains so characteristic of many of the summer storms.

Suitable Crops.

Experiments in the Callide Valley, extending over a period of years, have demonstrated that wheat and oats are the most reliable, and generally most successful, crops to grow for winter and spring grazing. Barley and rye have also been grown successfully. In addition to these, however, rape, sugarbeet, swede, and other turnips have been successfully grown in favourable seasons, the first mentioned yielding particularly heavy crops. As agriculture in the Central District generally is in an early stage of development, no doubt other suitable crops will subsequently be found. For the present, however, those already enumerated have been carefully tested and are recommended. While leguminous crops such as field pea and vetches or tares will probably grow well under good farming methods in some seasons, the customary dry spring introduces a considerable element of risk with them and, at this stage, they cannot be unreservedly recommended.

Establishing the Crop.

The seed sown should be sound, free from foreign seeds such as black oats or weed pests, and either from stocks which have been properly stored and safeguarded from insect infestation by the farmer, or procured from a reputable seedsman. The variety used should be one known to be suitable to the district.

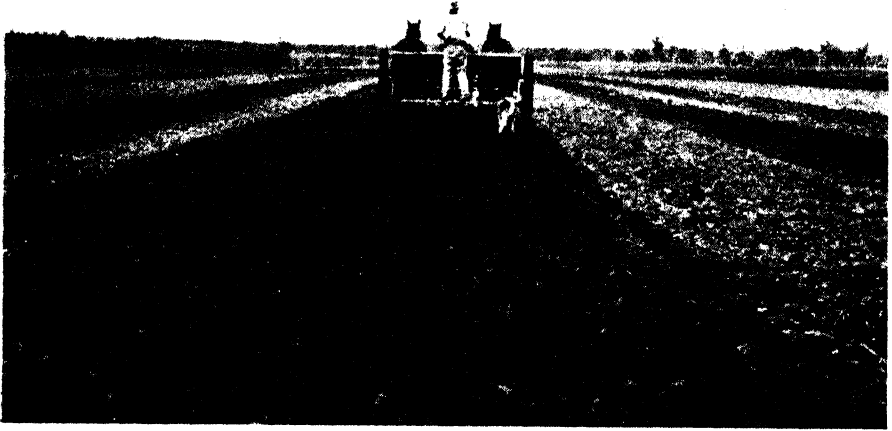


Plate 60.

SOWING AN OAT VARIETAL TRIAL.—Where a farmer does not grow cereals for grain production, it is advisable to purchase a drill if it is intended to sow any reasonably large acreage of winter fodder crops. Several types of the smaller grain drills marketed are suitable for this purpose.



Plate 61.

OAT VARIETAL TRIAL.—Note the differences in growth between the varieties at such an early stage in the development of the plants. It is advisable for the farmer to try out varieties to ascertain which are best suited to his conditions.

Sowing.

Sowing should be done as soon as possible after a good rain; if carried out before rain is received, the first subsequent rainfall may be just light enough to spoil the seed, and a fresh sowing will be rendered necessary.

It is better to temporarily subdivide into several parts the area to be planted, and to sow them at fortnightly intervals, rather than to sow the whole area on one date. Farmers are also recommended to introduce variety rather than to confine themselves to one kind of crop, thus the first sowing may be wheat, the second oats, the third barley, and so on. This arrangement will ensure a longer period of green grazing on a given area than would otherwise be the case, and will provide a healthful change of feed for the stock. In addition, it enables the farmer to ascertain which crop gives him the best results under his particular conditions. The same procedure can be followed with varieties, and suggestions may be obtained from the Department of Agriculture and Stock as to suitable varieties for different soils; these can then be tested in a similar way until the most suitable for a particular farm have been determined.

It should be remembered that winter growing cereals sown, say, in March or April, take a longer time to mature than when sown later in the season; hence the earlier sowings will give the longest grazing.

Rate of Sowing.

Speaking in general terms, heavy rates of sowing should be avoided as they tend to force maturity, whereas the objective in growing winter and spring fodders is to keep the crop in a green immature state as long as possible. The type of soil, particularly in respect to its moisture retaining capacity, will influence the sowing rate. Soils that dry out readily should be sown at a lighter rate than heavier retentive clays, which are capable of maintaining a greater plant population. Here again the farmer should experiment for himself, and endeavour to find the rates best suited to his own farm.

Depth of Sowing.

In the matter of depth of sowing, nothing is to be gained ordinarily by covering seeds deeply. The shallowest depth at which sufficient moisture will be available to complete the germination of the seedling and to establish it should be the objective; this will generally be found at from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, the actual depth depending on the climatic conditions and on the crop sown.

Method of Sowing.

Cereals may be drilled in with a seed drill, or broadcast, either by hand, or with any of the broadcasting machines on the market. There is every agricultural advantage to be gained by sowing through a seed drill; the plants are properly spaced at an even depth in the layer of soil containing the moisture required for germination, thus ensuring uniformity of growth, whereas when the seed is broadcast, the opposite result may be obtained. If, however, a seed drill cannot be procured, the broadcasting should be done when a tine cultivation has left the surface of the field evenly ridged, so that a light harrow drawn over the seed will satisfactorily cover it in the hollows. When broadcast, a field should be sown at a heavier rate than when drilled.

Wheat.

In choosing a variety of wheat for a grazing crop, the short season or quick maturing ones may be ruled out as being unsuitable on account of the comparatively short grazing period which they afford. Otherwise, any mid-season variety which will produce good hay is probably suitable for green feed; of this type, Florence, Warren, Warchief, and Clarendon have all been grown in the Central District with very satisfactory results.

Wheat may be planted in succession from March to late June to obtain the best results. A sowing rate of 50 lb. per acre should be used when the seed is drilled, and of 60 lb. if it is broadcast.



Plate 62.

SHEEP GRAZING WHEAT IN AUGUST IN THE CALLIDE VALLEY.—Excellent feed was available, whereas the native grasses in the adjacent pastures were lacking in food value and palatability.

The crop may be lightly grazed when the plants are 10 to 12 inches high. Regular grazing, alternated with spells for recuperation, may subsequently take place each time the plants have grown to 16 to 18 inches in height. It is advisable not to graze too closely in the earlier feedings. Wheat, but more particularly the green heads, imparts a slight taint to the milk, and should therefore not be grazed by cows within two hours prior to milking. This crop will do well on a greater range of the soils of the Central District than the other cereals that can be grown therein.

Oats.

The early maturing varieties of oats should be used in the Central District, as the later maturing ones go off badly with the onset of the dry spring. Of these early oats, Sunrise, Mulga, and Belar are suitable for March to May sowings, while Palestine and Buddah, which are very early, are more suitable for the later plantings. Good results have been obtained as late as July with Palestine when sown on long fallowed

land. Oats may be planted mainly from March to the end of June, using a sowing rate of 40 lb. per acre when they are drilled, and 50 lb. per acre when they are broadcast.

Barley.

Barley requires a well cultivated seed-bed on fertile soil, and the growing of this crop in Central Queensland is advised only where such conditions can be obtained. Most of the varieties of either wheat or oats that are suitable for that district will give better results than barley on the less fertile soils or where it has not been possible to prepare a suitable seed-bed for barley. It is a quicker maturing crop than wheat or oats, but it will give more second growth. It should be sown in March, April, and May at an average rate of 60 lb. per acre. Varieties which have proved very satisfactory are Skinless, Cape, and Chevalier; the second and third of these varieties are probably the best where heavy tonnage is required.

Rye.

Rye is perhaps the most suitable of the winter and spring growing crops for fodder production on poor soils. It will grow a good body of feed on poor, sandy soil where the other cereals would produce indifferently, and it is accordingly valuable as a winter and spring pasture. Suitable varieties are Black Winter for early winter grazing, and Emerald for later sowings. Rye should be sown at the rate of 40 lb. per acre if drilled, or at a slightly heavier rate if broadcast.

This cereal is subject to infection by the fungous disease known as ergot.* Infection takes place when the plants are in bloom, the disease subsequently manifesting itself as black, hornlike growths, replacing certain of the grains. These ergots, as they are called, are poisonous to animals.

Rape.

Rape is suitable for autumn sown pasturage as it makes very rapid growth, and is ready for grazing in ten to twelve weeks. It will stand successive grazings by cattle for longer than the cereals, being really a biennial plant, but it is more suitable for pigs and sheep. The crop may be sown also early in June in rows 2 ft. apart and cultivated, or it may be either drilled with the standard 7-inch spacing or broadcast. In soils which dry out readily it should be sown in rows, but in heavier and more retentive soils the crop does very well when either drilled or broadcast. Sowing rates vary from 4 to 8 lb. per acre according to the method of planting. Dwarf Essex rape is the variety that has so far given the best results.

If fed to dairy stock, it is well to remember that rape is liable to cause bloat. It may also taint the milk, and cows should, therefore, not be grazed on it within two hours of milking time. It is an excellent grazing crop for pigs, and is recommended for that purpose.

Sugarbeet and Mangold.

While sugarbeet and mangold are botanically identical, they have been gradually evolved by selection to serve two distinct purposes, the mangold to provide a high yield of succulent food with a maximum content of dry matter, and the sugarbeet to produce a maximum

* *Claviceps purpurea*.

amount of sugar unaccompanied by a very large root development. The roots of both plants are readily digestible and are a valuable winter feed for farm stock.

Both crops should be confined to deep, well-drained loams or light clay loams, as either poor sandy soils or shallow soils overlaying stiff clays are definitely unsuitable. In the Central District they are best sown in April or May.

The land should be ploughed to a depth of at least 7 or 8 inches, as the plants are deep rooters, and require a loose soil in which to expand. The best results will be obtained by planting on ridges spaced 2 feet 6 inches to 3 feet apart; these are made by throwing two furrows together with a single furrow plough, and then running a light roller from end to end to flatten and firm the soil.

Seed may be sown with a drill, but when small areas are to be sown, the seed is usually dropped by hand in shallow drills. A sowing rate of 5 to 7 lb. per acre is sufficient. The plants should be thinned to a single spacing of 12 to 18 inches apart when four leaves are showing, the wider spacing being required for the mangold.

The leaves become yellow when the roots are ripe, which will be about seven months from the time of planting; hence these two crops are not, strictly speaking, winter and spring fodder crops. In this climate the roots should then be lifted, as otherwise the plants will run to seed. Unfortunately, temperatures in the Central District are too high to admit of safe storage for any considerable length of time, but the roots may be kept fairly well for short periods under a shed when thin layers are laid down with plenty of straw in between them.

Mammoth Long Red is a variety which has given good results, but intending growers should apply to the Department of Agriculture and Stock, giving a description of their soil, for suggestions as to the most suitable variety to grow.

C.—IN NORTH QUEENSLAND.

Throughout the areas of North Queensland in which general agriculture is practised the major portion of the annual rainfall normally occurs during the summer months, and good winter rains are the exception rather than the rule. In view of this and of the fact that the summer rains almost invariably are sufficiently reliable for the production of a number of bulky and nutritious summer fodder crops, it is essential that attention be paid to the production of these to provide the bulk of the annual fodder requirements. This applies particularly to the Atherton Tableland, where it is definitely unwise to depend upon results that may be obtained from autumn and winter sowings when the rainfall is usually light and unreliable. Nevertheless, it is considered advisable that every opportunity be taken to supplement the main summer production by making additional sowings of suitable fodder crops during the period from April to June. By doing so, a continuity of succulent fodder can be maintained in favourable seasons during the period from December to August to supplement the pastures, following which the conserved summer-grown reserves may be drawn upon to carry the stock over the critical dry **spring** and early summer period experienced in these areas usually up to the middle of November. Early storm

rains, which normally occur about that time, relieve the position by refreshing the pastures and enable quick maturing summer varieties of fodder crops to be sown.

In the annual cropping programme, provision should be made for setting apart a sufficient area of land to permit of a continuity of sowings of winter and spring fodder crops extending from April to June; in addition thereto, however, in order to utilise the interrow space in the late sowings of such row crops as maize, when seasonal conditions are favourable, a mixture of oats and rape should be broadcast therein. The latter procedure will furnish suitable additional fodder on these areas for use immediately following the grain harvest.

It is usually inadvisable to extend the main seasonal sowings beyond June, as, almost invariably, sowings made later than that month fail owing to the rainfall being insufficient to permit of crops reaching a profitable stage of growth.

Preparation of Seed-bed.

When land is required for autumn and winter sowing, it is most essential that it receive an early preparation, as the best results can only be expected when the land has received a deep ploughing late in summer, this being followed by sufficient shallow cultivations to maintain a good tilth until sowing time. Land so treated should contain ample soil moisture to ensure a good germination; furthermore, weed growth would be controlled, thus providing the clean firm seed-bed so essential to the best development of winter cereal crops.

Sowing.

In sowing, emphasis is placed on the value of drilling as against broadcasting. In addition to a saving in seed by the use of the seed drill, more even growth with a deeper and firmer root development is obtained, which enable cereals to withstand repeated grazings. Irrespective of the particular method of sowing that is used, it is considered a good practice to firm the surface of the sown area by means of a light roller. This is more particularly advisable on the light, deep volcanic type of soil, the surface of which is inclined to dry out rather rapidly.

Suitable Crops.

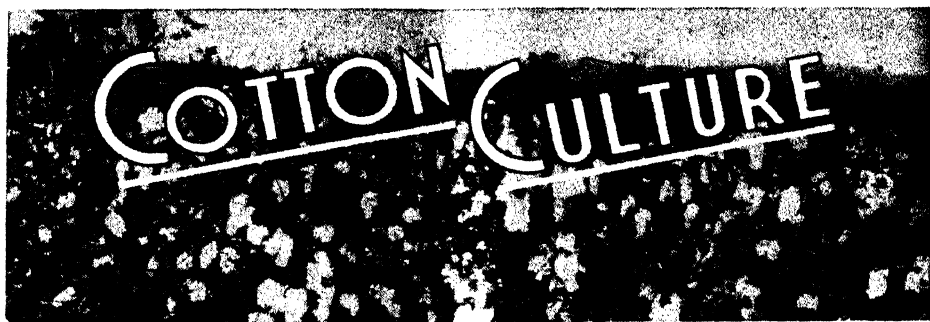
The principal crops which yield the most productive results are mostly those particular varieties of oats, wheat, rye, and barley which are best adapted to grazing. At times, satisfactory hay crops are obtained from some varieties, but hay making is successful in North Queensland only under exceptional conditions. The following varieties of wheat have given satisfactory results for grazing purposes:—Florence, Cleveland, Warren, and Currawa. They should be sown during May and June at the rate of 50 to 60 lb. per acre, the latter rate of sowing being adopted in the case of broadcast crops. The most suitable varieties of oats are Algerian, Mulga, and Campbell's Prolific. The lastmentioned is a variety which is grown to only a limited extent in this State, but it has done well on the Atherton Tableland. Sowings should be made whenever conditions are suitable from March to May, the usual rate of sowing being 40 lb. per acre when drilled and 50 lb. per acre when sown broadcast.



Plate 63.

AUTUMN GROWTH OF OATS AND RYE SOWN IN MAIZE.

The addition of a suitable legume, or other fodder species, to the mixture sown, in order to enhance the food value of the resultant crop, is worthy of consideration. The following crops and varieties thereof are recommended for this purpose:—Dun and Grey or Partridge field pea, purple vetch, golden tare, and giant kangaroo or broadleaf Essex rape. The field pea is best sown as a mixture with a cereal such as wheat or oats in preference to being sown alone. Like the field pea, vetches or tares are best sown as a mixture with a cereal and should be sown in the same way. With respect to rape, Tableland conditions render it advisable, where possible, to sow the crop with a drill to ensure the seed coming in contact with the moist soil. It should be sown in drills just wide enough apart to permit of interrow cultivation to deal with weed growth until the crop becomes established. Sowing should be carried out at the rate of 4 to 8 lb. per acre according to the method adopted.



The Value of Early Ploughing for the Cotton Crop.

W. G. WELLS, Director of Cotton Culture.

THE yields of cotton which have been obtained in both investigations and commercial plantings in the districts south of Mackay have amply demonstrated the advisability of planting cotton in these areas only on land that has not been cropped more than three seasons following the breaking up of old grassland. In some instances, however, growers have failed to obtain satisfactory returns from crops planted on newly broken up grassland, especially old Rhodes grass pastures. An examination of the causes of low yields when good cultivation has been maintained, has usually indicated either that the crops were late planted or that they received insufficient rainfall to enable an early planted, heavily-laden crop to develop satisfactorily under stress conditions in December and January. In either case, in most seasons, had the land been ploughed early enough to conserve some of the late summer rainfall and to trap the autumn, winter and early spring rains, there would generally have been sufficient subsoil moisture to increase markedly the prospects of obtaining satisfactory yields.

The value of early ploughing for the cotton crop is not appreciated sufficiently by most cotton growers in these districts. Generally speaking, after June the rainfall is most irregular and uncertain until storms introduce the summer rains, yet many farmers do not plough their land for cotton until July or August, when the surface soil is often dry and hard. Good ploughing is impossible under these conditions and in addition the subsoil is generally dried out through the demands of the previous crop.

Late ploughed land usually requires a penetrating planting rain that will consolidate the seed bed and provide the moisture needed to obtain a satisfactory stand of cotton seedlings and to maintain them during the prolonged hot dry weather which is frequently experienced in the late spring or early summer. Unfortunately the rains received at the start of the regular planting period seldom penetrate beyond the depth of the ploughed soil. As the cotton stand obtained early in October in the Central District and in the second half of that month in the southern districts largely controls the chances of producing a good crop, most farmers plant then following the occurrence of a good germinating rain, hoping that further rain will occur in time to establish the resultant seedlings. If sufficient rain does not eventuate within the required period, then the crops may be completely lost or a thin stand survives which cannot exploit the full producing potentialities of the soil. In some seasons it may not be possible to replant until too late to

produce a profitable crop. It is obviously very important, therefore, to have ample supplies of subsoil moisture available at the start of the regular planting period to ensure the maintenance of the first stand obtainable.

Where late summer ploughing is done, there is usually less weed and grass growth in the following cotton cultivation than is the case where cotton is planted on an area ploughed late in the winter. In one demonstration conducted in the Upper Burnett, in a virgin pasture on a forest slope, mid-March ploughing was compared with May ploughing in a very dry autumn. Owing to lack of rain, planting was delayed until the 23rd of November. Although dry conditions broken by light storms, prevailed for the rest of the season, it was not possible to maintain clean cultivation in the later ploughed area with three cultivations with a disc cultivator, whereas at the end of the season the earlier ploughed area, which received only this number of cultivations, was more or less free of weed and grass growth. In addition a yield of 600 lb. seed cotton per acre was obtained as compared with approximately 400 lb. on the later ploughed area.

Numerous other illustrations have been obtained in demonstrations and in commercial plantings, of the advisability of ploughing land in late summer for the following crop of cotton. During the 1943-44 season at the Biloela Research Station, March and June ploughings of three year old Rhodes grass on forest alluvial clay loam have appreciably outyielded later ploughings of both Rhodes grass land and old cultivations. Although a very dry January affected yields, by the end of February 876 lb. seed cotton per acre had been picked in the March ploughed areas and 794 lb. in the June ploughings, with probably 200 lb. per acre more to open in each ploughing, as compared with an estimated total yield of not over 500 lb. for later ploughed Rhodes grass and less than that amount for old cultivations.

Soil moisture determinations indicated that at planting time early in October, the March ploughed areas were wet to 34 inches as compared with 22 inches in the June ploughing and only 17 inches in the August ploughed old cotton cultivations. As an inch of steady rain will penetrate only approximately 6 inches in dry firm soil of the clay loam soils on which most of the cotton of this State is grown, it would require at least six inches of penetrating rain occurring within a week to wet August ploughed land to the depth that was attained through the March ploughing.

It has been found at the Research Station that where isolated one-inch thunderstorms of the torrential type occur at mid-season after the ploughed soil has firmed, an average penetration of not over four inches may be obtained in flat alluvial, dry clay loams. Consequently it is only when very prolonged wet conditions are experienced that any marked penetration of rain to the lower subsoils occurs during mid-season. Soil moisture determinations have also shown that in many seasons the cotton crops grown on late July and August ploughed old cultivations at the Research Station have been produced with the moisture contained in the upper two feet of soil. As an early planted cotton crop will at mid-season practically exhaust the moisture from the upper foot of soil within a fortnight, such crops have been dependent on the regular occurrence of timely soaking rains to maintain a steady development of the plants and their fruiting systems. Where the rains have been delayed much past this period, checking of plant growth with a consequent shedding of flower buds and small bolls has resulted.

It can be realised, therefore, how cotton crops planted early on late ploughed areas are dependent on the occurrence of either frequent penetrating rains during January and February or good penetrating rainfall in October, early November and late December to provide sufficient subsoil moisture to enable the plants to withstand stress conditions in a dry January or February.

It is realized, of course, that under favourable conditions cotton crops grown on land ploughed even as late as the end of August may produce satisfactory returns. Such results have occurred, however, mostly when the plantings have been made after good rains prior to mid-November, and exceptionally good rains have fallen in December, followed by dryish conditions during January and good rainfall in February. The plants had thus enough moisture to promote a steady slow growth until the December rainfall provided ample subsoil moisture. The dryish conditions in January prevented rank growth occurring as a result of the December rainfall, and then the February rains were sufficient to continue the development and maturation of the crop. Unfortunately such ideal conditions do not occur each season for, as a rule, a stress period is experienced some time in the growth of the crops and in the absence of adequate subsoil moisture, the plants react severely.

It is urged, therefore, that growers make every effort to plough for cotton during March or early April and if possible use old grassland. If this is not available, then, where a small acreage of cotton is to be planted, land that has been under either Sudan grass or giant setaria (giant panicum) may be used. Under no circumstances should cotton be planted following either Japanese millet or white panicum owing to the extra cultivation costs incurred as a result of the volunteer seedling growths from these crops. Where a large area is to be planted and the required acreage of grassland for early ploughing cannot be obtained, as much grassland should be ploughed as possible and the remainder of the intended area made up from land that is in the second year of cotton following grassland or failing that, land that has been in Sudan grass or giant setaria. In this way early ploughing of all but the cotton land can be done. By removing the old plants as fast as the crop is harvested and following quickly with the ploughing, it may be possible to plough the cotton land in time to conserve much of any late autumn and winter rainfall experienced. The second year cotton land generally should also be sufficiently permeable to trap efficiently most of the summer rainfall, especially prior to the cessation of the cultivation operations.

It is strongly stressed, however, that cotton should not follow cotton if the land has been three years or more out of grassland, unless irrigation facilities are available. It is this practice that is largely responsible for the poor yields obtained by a large number of farmers each season.

It is also urged that, where land has been ploughed early and a wet autumn or early winter has made it necessary to cross plough, only a light skim cross ploughing be done in order that the least possible drying out of the subsoil will be caused. Deep cross ploughing dries out not only the loose surface soil but also the upper subsoil. Consequently very good planting rains will be required to obtain a satisfactory germination and to maintain the resultant seedlings until they are thoroughly established.

From the results which have been obtained in demonstrations and commercial plantings, early ploughing can be expected to increase appreciably the average yield of cotton per acre in most seasons and should therefore be practised by all cotton growers.



Packing Houses and their Equipment.

JAS. H. GREGORY, Instructor in Fruit Packing.

Packing Sheds.

THE prevailing shortage of manpower makes it necessary for growers to use every method that will expedite the handling and packing of fruit consignments. As war conditions have made it difficult to obtain supplies of shed equipment it is felt that information on packing houses and their accessories would be of assistance to growers desiring to erect or equip their own packing sheds. The writer has often noticed the inefficient methods of handling fruit crops on properties where no effort has been made to shorten the time required for casemaking, packing, and despatching by the use of packing-shed accessories. The increased speed and ease of handling would soon recompense growers for their outlay on packing and casemaking benches, conveyors, &c.

Packing Shed Equipment and Shed Layout for Fruits such as Apples, Pears, Citrus, and Stone Fruits.

In dealing with packing sheds it is essential to study economy of working. This is attained by having the work going or moving in one direction through the shed, so that the packers and floorman nailing down and despatching do not get in each others' way whilst working; receiving and having fruit stacked in places to permit as short a distance as possible of movement to sizing machines or packing bins; gravity conveyors, if possible, to carry cased fruit to lidding press or trucks. A study of the two packing-shed layouts submitted will help to show how the work is arranged to obtain these results.

The design of the large shed (Plate 64) is suitable for the handling of an output of 2,000 to 3,000 cases per week if fruit can be loaded daily on rail. This plant would be suitable for small co-operative companies and central community packing houses.

The smaller shed illustrated (Plate 65) is very suitable for the average grower, allowing easy handling of 250 cases a day. If the grower has not available gravity conveyors and nailing-down press, a good nailing-down stand is made by laying two pieces of 3 by 2 or other suitable timber on the floor for nailing down upon. These battens permit the bottom of the cases to bulge when the lid is placed in position and nailed. As will be seen by examining the diagram the same principle of continuity from the reception of the fruit to its despatch is followed as in the larger shed.

It will be seen the plant required in the packing shed is confined to casemaking bench, packing stands, sizer, and accessories for casemaking and packing. A description of how to make these will help the home carpenter.

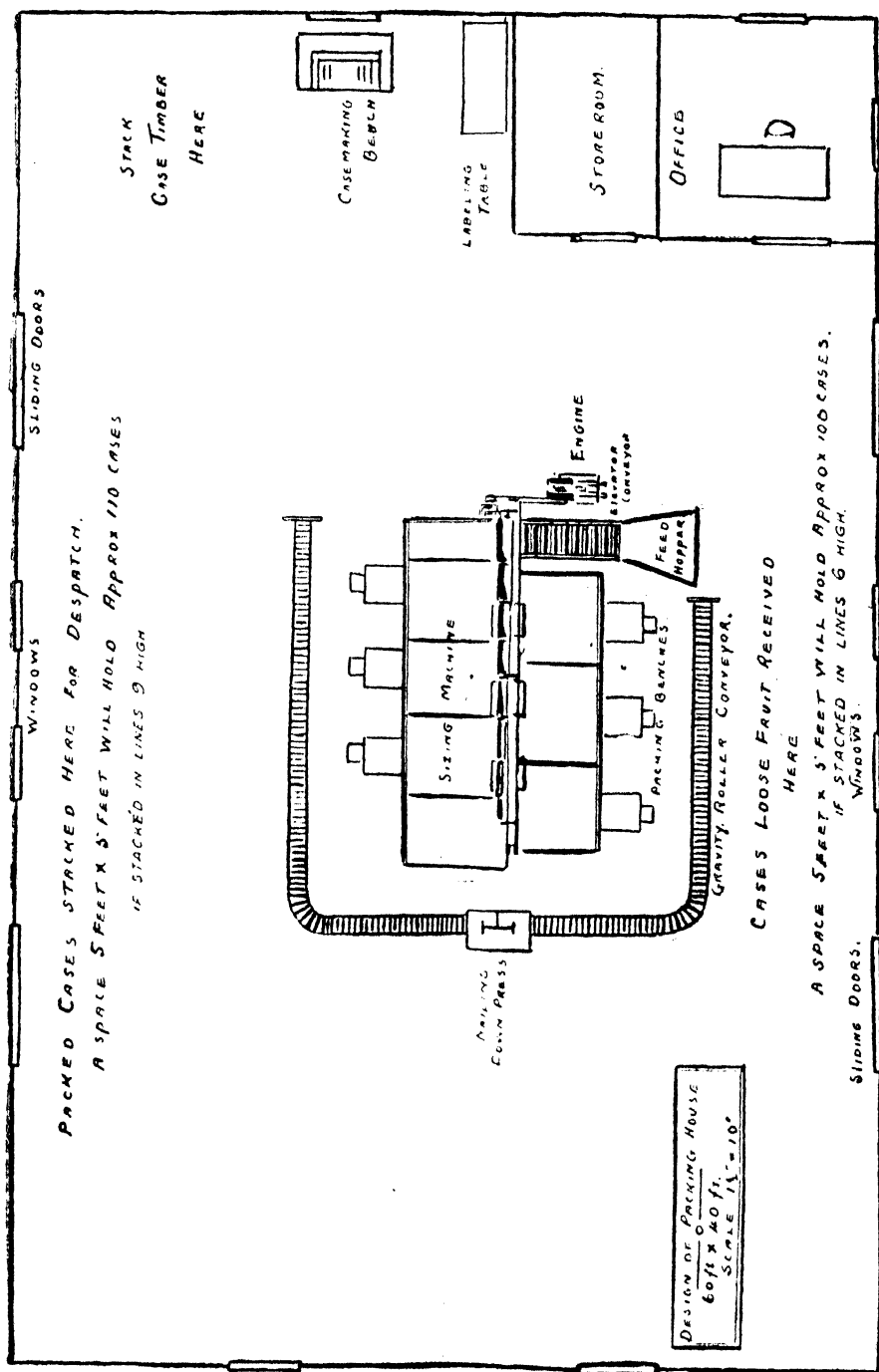


Plate 64.

SUGGESTED LAYOUT FOR LARGE PACKING SHED, USING DOUBLE-SIDED SIZING MACHINE AND ROLLER CONVEYORS.

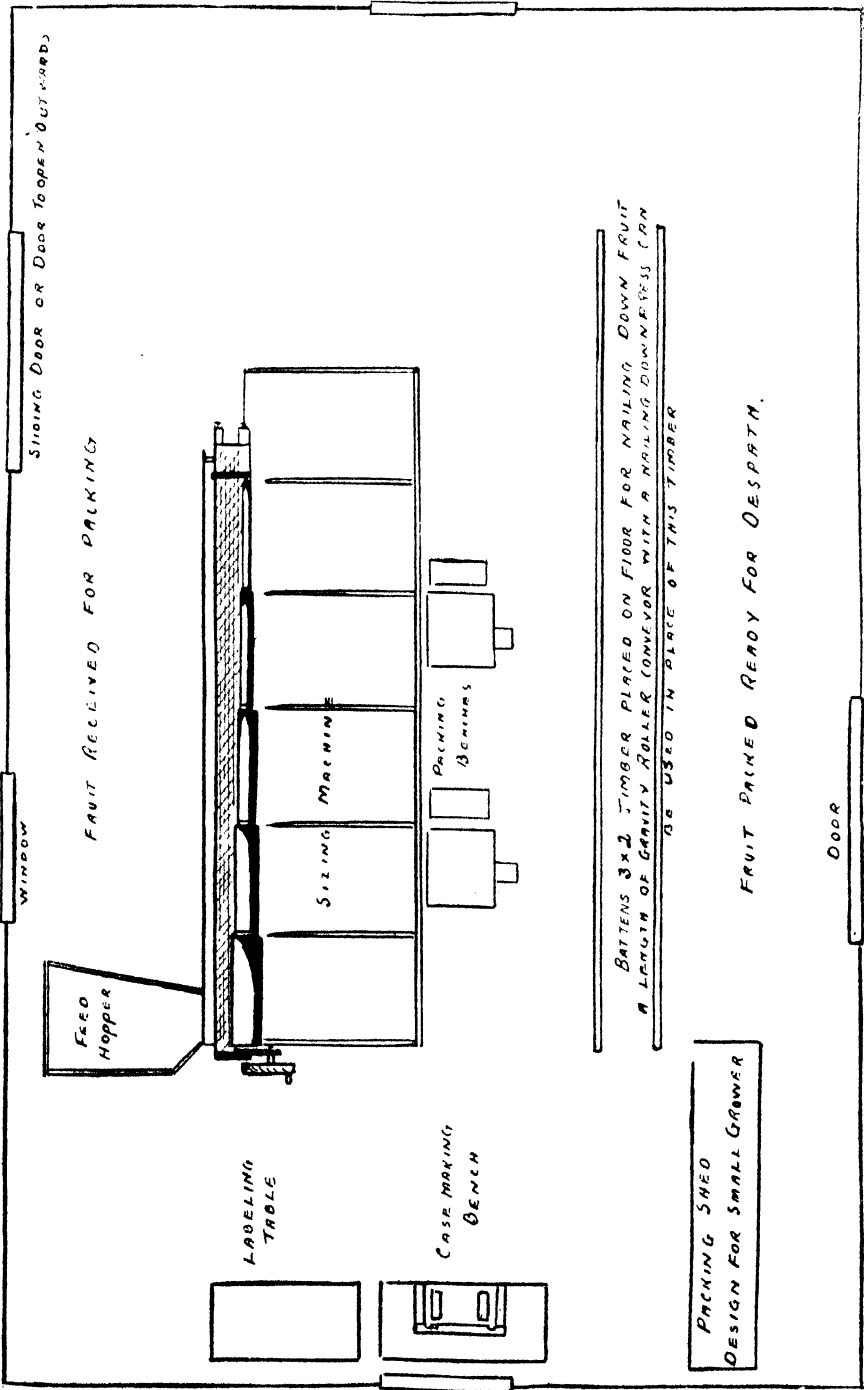


Plate 65.
SMALL SHED EQUIPPED WITH SINGLE-SIDED SIZING MACHINE SUITABLE FOR THE AVERAGE SMALL ORCHARD.

Particulars of Sizing Machine (see Plate 66).

The pulleys (A) can be made from any round timber, a diameter of 6 inches being suitable.

The turning wheel (B) is not absolutely necessary but the addition of this assists greatly in the easy running of the machine.

The grading or sizing board (C) can be made like either of the shapes shown. If made with each size stepped as shown, each step is $\frac{1}{4}$ inch. The board should be mounted on brackets and slotted to enable the board to be adjusted for smaller or larger fruit so that the fruit can be sized into any of the bins. The distance from the bottom edge of each step on the board, to the belt, should equal the diameter of the fruit to be sized into each bin. Where the run of fruit is large, i.e., $2\frac{1}{2}$ inches and larger, the board can be raised so that the first step marked $2\frac{1}{4}$ inches is raised to $2\frac{1}{2}$ inches enabling all the bins to be used.

The board (D) to support the belt which carries the fruit, should be planed smooth and free from anything likely to catch or cause wear on the belt. The belt (E) for this machine should be made of heavy canvas or other suitable material and should be at least 5 inches in width. The iron supporting brackets (F) to hold the sizing board (C), should be slotted to enable the board to be adjusted higher or lower as required.

If a revolving roller is used instead of the fixed board, it can be made out of a length of galvanised water piping, minimum 2 inches in diameter or the wooden centre of a paper or lino. roll.

This sizer will not be altogether suitable for sizing mandarins or tomatoes.

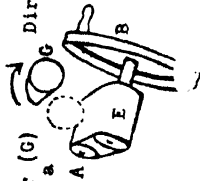
Particulars of Hand-sizing Gauge.

A handy sizing gauge can be made by cutting holes 2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, 3 inches, and $3\frac{1}{4}$ inches in diameter in a piece of plywood 24 inches x 6 inches (Plate 76). Packers will find it helpful to mark the size of the hole plainly on the gauge opposite each sizing hole. The pack and count which is used for fruit of that particular size can also be printed in and will assist new packers. It must be noted that a $2\frac{1}{4}$ -inch fruit is one that will drop through a $2\frac{1}{2}$ -inch ring but not through a $2\frac{1}{4}$ -inch ring, and so on. The same idea can be used on a smaller scale for making a sizing board for plums, with holes $1\frac{1}{4}$ inch, $1\frac{1}{2}$ inch, $1\frac{3}{4}$ inch, $1\frac{1}{2}$ inch, $1\frac{3}{8}$ inch. By printing the names of the varieties of plums alongside the hole which measures the minimum diameter permitted for market with that variety, the grower will have a first-hand guide available for use when necessary during the marketing period.

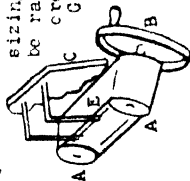
Casemaking Bench.

The cost of timber is approximately £1, and the price will be repaid many times during a season by the increased output and with the advantage of a better-made box. The illustration (Plate 67) shows the complete bench made to take cases without a partition, whilst Plate 68 is the top of the bench which would replace the top of Plate 67 if the bench was to be used for making cases with a partition. Cases are always measured by the internal dimensions, so it is necessary to always take care that the inside length of the case corresponds to the distance between the notches in the back step (A) (Plates 67 and 68). Some growers use a tree stump for a bench. This is quite a good base for a bench and will do excellent

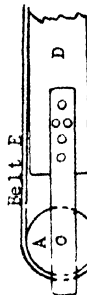
Showing a roller (c) used instead of a fixed board.



- D. Board to support fruit carrying belt.
- E. Carrying belt for fruit.
- F. Iron supports for sizing board. These should be made adjustable to enable the sizing board to be raised or lowered.
- G. Revolving roller which can be used instead of a fixed board.



END VIEW.
Sizing belt tilted to enable fruit to run off machine.



Method of fixing pulley for carrying belt.
A. Belt Pulley
B. Wheel to turn grader.
C. Sizing stick or board.

A sizing stick of this shape can be used instead of the one shown.

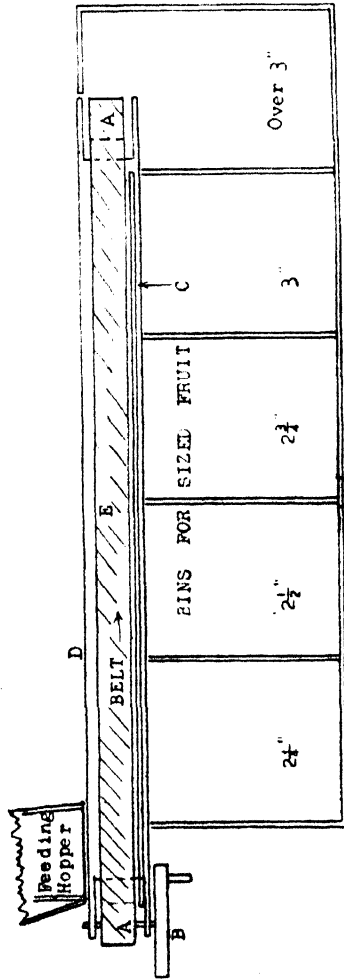
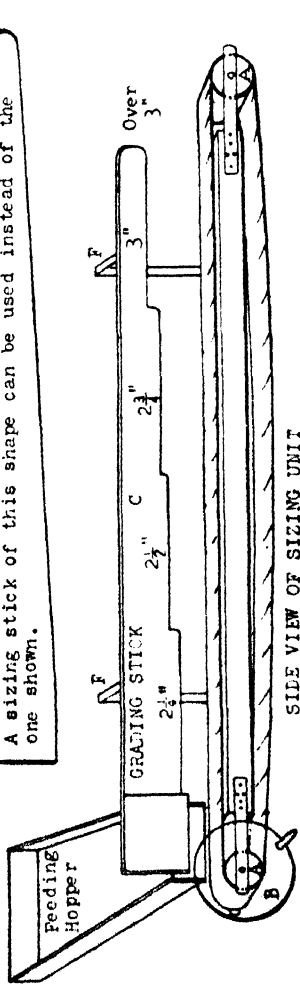


Plate 66.
PLANS FOR A HOME-MADE SIZING UNIT.

work by adding just the bench stops to the top of the stump. When attaching the legs on the bench they should be placed as nearly as possible under the slots that hold the case ends. This gives a solid base for nailing.

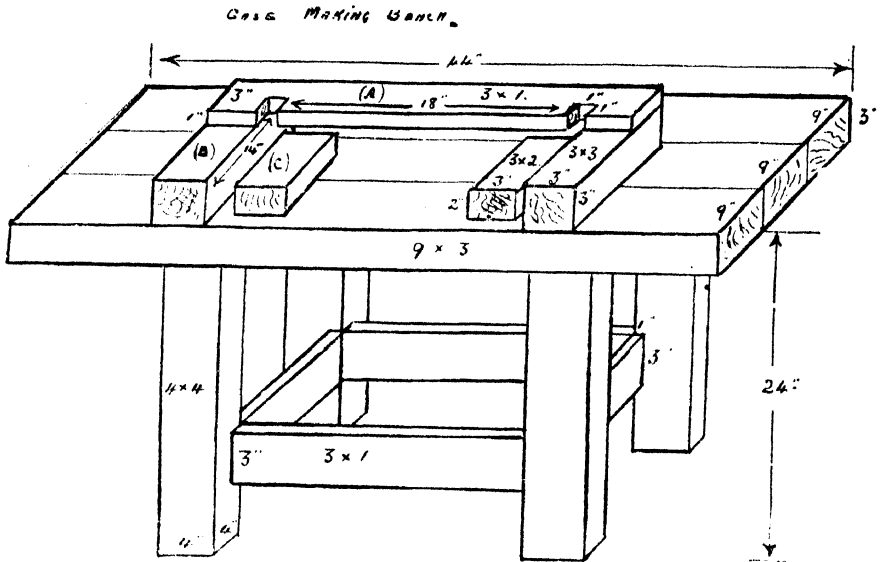


Plate 67.

CASEMAKING BENCH FOR MAKING AUSTRALIAN DUMP, CANADIAN STANDARD, BUSHIEL AND HALF-BUSHIEL CASES, AND OTHER FRUIT CASES, 18 INCHES IN LENGTH, INSIDE DIMENSIONS.

Specifications.

Height ..	24 inches from floor	Timber.—Legs ..	4" x 4"
Width ..	27 inches	Inside ..	3" x 2" (c)
Length ..	44 inches	Stops—outside ..	3" x 3" (B)
		Back ..	3" x 1" (A)
		Top ..	9" x 3"
		Stays ..	3" x 1"

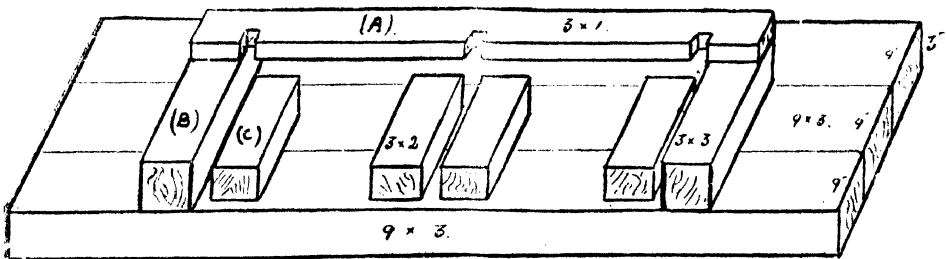


Plate 68.

CASEMAKING BENCH FOR MAKING LONG BUSHIEL CASES OR OTHER CASES WITH A PARTITION.

Casemakers' Nail Comb.

As a help to casemakers a nail comb (Fig. 69) for picking nails up with the heads in one direction will be found useful. The comb is made of a heavy piece of galvanized iron turned to clip on to the end of the nail box with a number of knitting needles soldered to the iron. The knitting needles are placed so that nails will slide between them easily,

without dropping through, and remaining suspended by their heads in the comb. A comb with up to sixteen needles is a handy size for working, and will hold enough to make ten to fifteen cases. The needles are best placed with the ends shaped in a circular manner, the centre needles projecting about 6 inches and the side needles 5 inches. The comb is used by scraping or pushing it through the nails in the box. The cost of the comb is the price of four sets of knitting needles, and the necessary solder (approximate cost 2s. 6d. in most country districts).

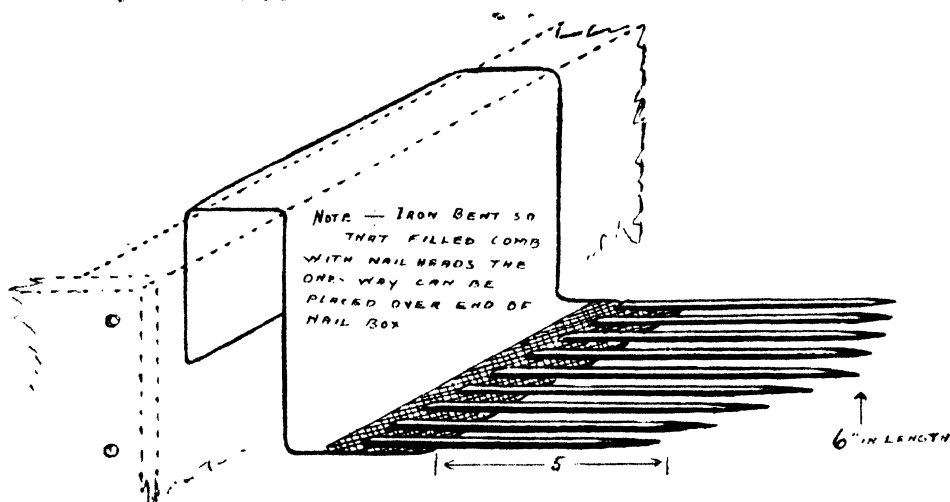


Plate 69.

CASEMAKER'S COMB.—Made of galvanised iron and knitting needles.

Fruit Packing Bench.

Packing is a tiring work and a job that cannot be done properly, as some packers think, by sitting down. Many growers make no effort to make packing easy, and often condemn packing fruit such as tomatoes as too hard, simply because they endeavour to pack with their case level and have difficulty in getting the fruit to remain in place. This difficulty can be overcome by building the packing stand illustrated in Plate 70 with one end of the case higher than the other. With this stand packing is done from one end of the case and not from the side. This allows the tilt on the case to keep the fruit in position without the packer having to hold it in with one hand as when packing from the side, thus leaving both of the packer's hands free for working. The packing stand illustrated is for use when wrapping fruit, but with fruit such as tomatoes, passion fruit, or other unwrapped fruit it is not necessary to have the tray for holding the wrapping paper. The paper-holder is best made to take the largest sized paper used in wrapping citrus and deciduous fruits. If made 4 inches deep at the back and 2 inches deep in front, with the front cut out in the centre as illustrated, a large quantity of paper can be held in the holder. The paper-holder should be placed at the height most suitable for the comfort of the packer. The packing needle illustrated in Fig. 71 is a useful addition to the packing bench, with paper-holder.

Spring Board for the Comfort of the Packer.

Illustrated with the packing stand is an easily made accessory to ensure comfort and ease for a long day's packing. Standing on a hard

cement or wooden floor all day whilst packing is very hard on most packers, particularly female operatives. Nearing the end of the day a packer's output for the last couple of hours is often curtailed through aching legs and back. This can be largely overcome if not entirely eliminated by the use of a spring board to stand upon (Plate 70). Made from timber surrounding bales of wrapping paper the cost is nil, but the expenditure of a few pence on 6 feet of 6 by $\frac{1}{2}$ inch timber for the top and 3 feet of 2 by 2 inch for the two battens at the ends will soon be repaid by the extra comfort and efficiency given. The cost of the packing stand and spring board should not exceed 40s. complete.

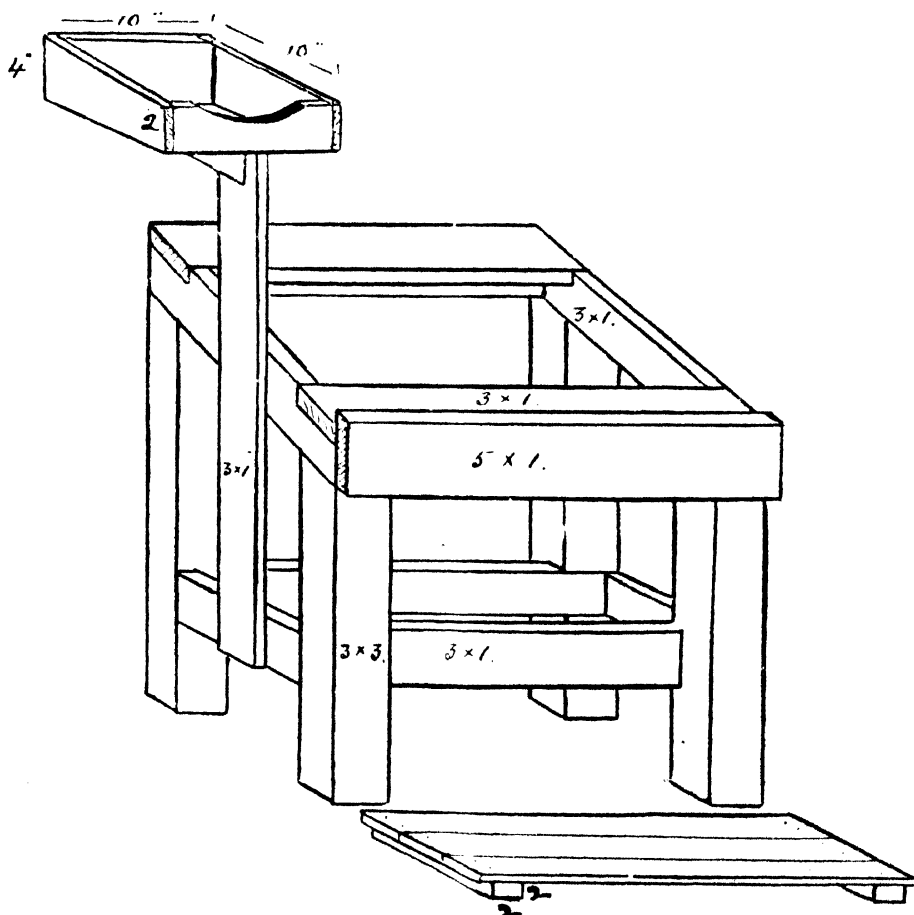


Plate 70.

FRUIT PACKING BENCH AND SPRING BOARD.

Specifications.

Height in front	..	22"
Height at back	..	27"
Depth from front to back	..	18"
Size of Paper Tray	..	10" x 10" Inside Dimensions
Legs	..	3" x 3"
Stays	..	3" x 1"
Front board	..	5" x 1"

Wrapping Paper Needle Holder.

This is a useful accessory, and when used in conjunction with the wrapping-paper holder will be found to be a good insurance against paper wastage. It is simple to make, using a small sheet of heavy galvanized iron, copper, or brass cut and bent to the required shape to allow the needle to slide up and down through it. The needle is made of a 15-inch length of a heavy gauge galvanized or fencing wire, turned over 4 inches from one end and pointed to make the needle. The turn should be made to allow about 1 inch between the needle and the sliding portion holding the weight. The sliding portion should be filed square to enable it to slide through the supporting plate. A phonograph needle fitted in the end of the needle portion is an improvement on just pointing the wire. The needle can be fitted by drilling and soldering or by putting a thread on the end with a set nut. The weight is made of lead, and needs to be about 6 ounces in weight. The cost of this accessory (Plate 71) is practically only that of the labour.

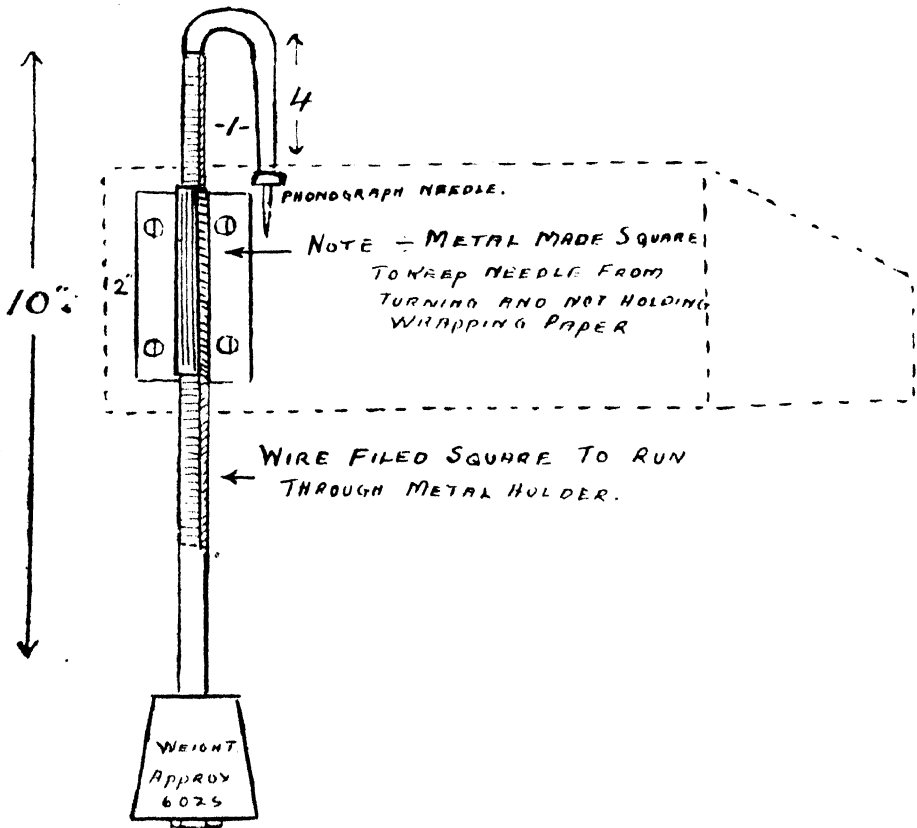


Plate 71.

PACKER'S NEEDLE TO HOLD WRAPPING PAPER IN POSITION.—The paper holder is represented by dotted lines. The weight should be about 6 ounces.

Case-end Scraper.

A cheap and efficient case-end scraper for removing dirt or stencil ink smudges can be made out of an old file shaped and sharpened (Plate 72). Any blacksmith will make this tool for a few pence, and it will be most useful in the packing house.

Fruit Case Lidding Press.

No packing shed should be without this accessory. Whilst there are many excellent presses on the market, some growers may prefer to make their own. The cost of the timber and materials for the press is about 10s. The materials necessary are 8 feet of 3 by 3 for the legs, 28 feet of 3 by 1, two bolts 3 inches long, and four 1½-inch screws with washers to match. Two-inch nails will be found long enough. The short lengths of wire required for the press vary in length according to the case used, and require to be made of heavy-gauge wire. The short lengths of 2 by 1 and 1 by 1 timber required for the stops and press (see Plate 73) can be cut from a piece of 3 by 1 ripped down. It is necessary to allow about 4 inches clearance of the top of the press above the case to allow for variations of the height of the fruit in the case, and the amount of bulge required on the lid when nailing down. A close examination of the illustrations will show how to build the press. The wires are attached to the pressing stays by drilling the wood with two holes about 1 inch apart and bending the wire to fit. Care should be taken to see that the end of the wire does not project through and damage the lids when pressing. The bottom end of the wire is attached to the stays by the 1½-inch screws and washers, an eye being formed by carefully bending the wire to fit around the screws. It is necessary to have the wire hinged in this way to enable the pressure stays to be brought easily over the lid of the case. The ends of the two pieces of wood placed across the frame, on which to stand each end of the case when attaching the lid, should be allowed to project on either side and be shaped to stop the wires from falling flat over either end of the frame. This saves a lot of reaching for the press when operating.

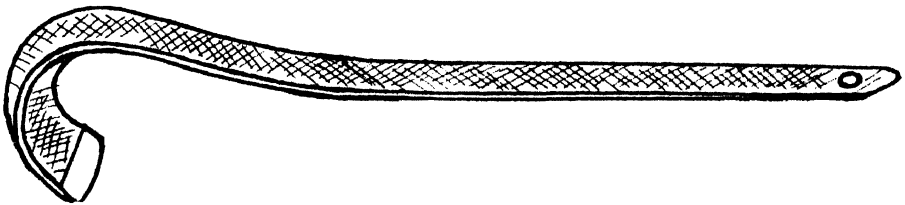


Plate 72.

CASE-END SCRAPER.—Made from an old file or rasp.

Stencils.

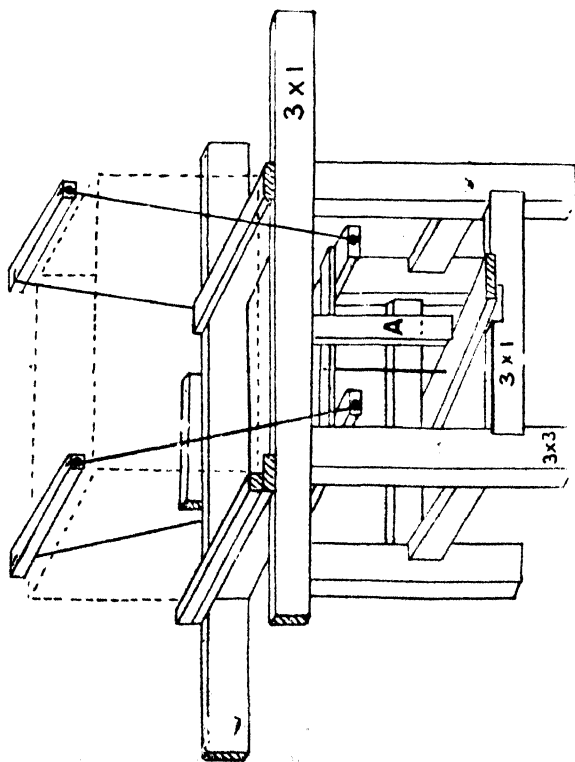
Stencils are another necessity in the packing house, a grower needing sets of stencils for all varieties of fruit, sizes, and packing counts used; also a stencil plate with his name and full address as follows:—

J. SMITH,
Stanthorpe,
Queensland,
Australia.

This is necessary when a grower is going to export. A spare sheet of light gauge zinc, out of which stencils can be cut with a pocket knife, is a handy standby for emergencies. Thick papers, such as malthoid or paper mulch for pineapple plants, may be used in emergencies.

A good inkpot to use for stencilling is easily made out of the bottom of a kerosene tin and a handful of cotton waste, a block of stencil ink, and the necessary water to saturate it without having any surplus. A block of stencil ink used this way, will go many times as far as when used on a board as is the general practice.

Dotted lines show case in position.

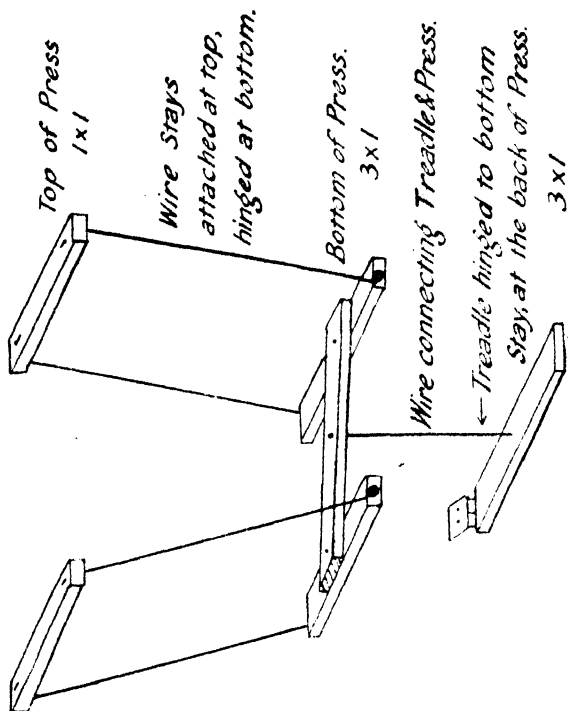


CASE LIDDING PRESS.

Specifications.

Length	..	4 feet
Width	..	12½ inches
Height	..	2 feet
Timber—Legs	..	3" x 3"
Frame	..	3" x 1"

(A) This is a board hinged to the top rest, bearing on the treadle and holding down the lid whilst nailing, thus making it unnecessary to keep pressure on the treadle with the foot.



PRESS WITH FRAMEWORK REMOVED.

Length of wires 19 inches for standard case.
Length of bottom wire 12 inches.

Paste for Labels.

Growers using labels will find that ordinary flour paste is quite satisfactory for attaching labels. The addition of a small quantity of alum or bluestone will assist in keeping the paste indefinitely. Care should be taken to keep paste with bluestone added in enamel or porcelain containers only, as bluestone will soon corrode tinware.

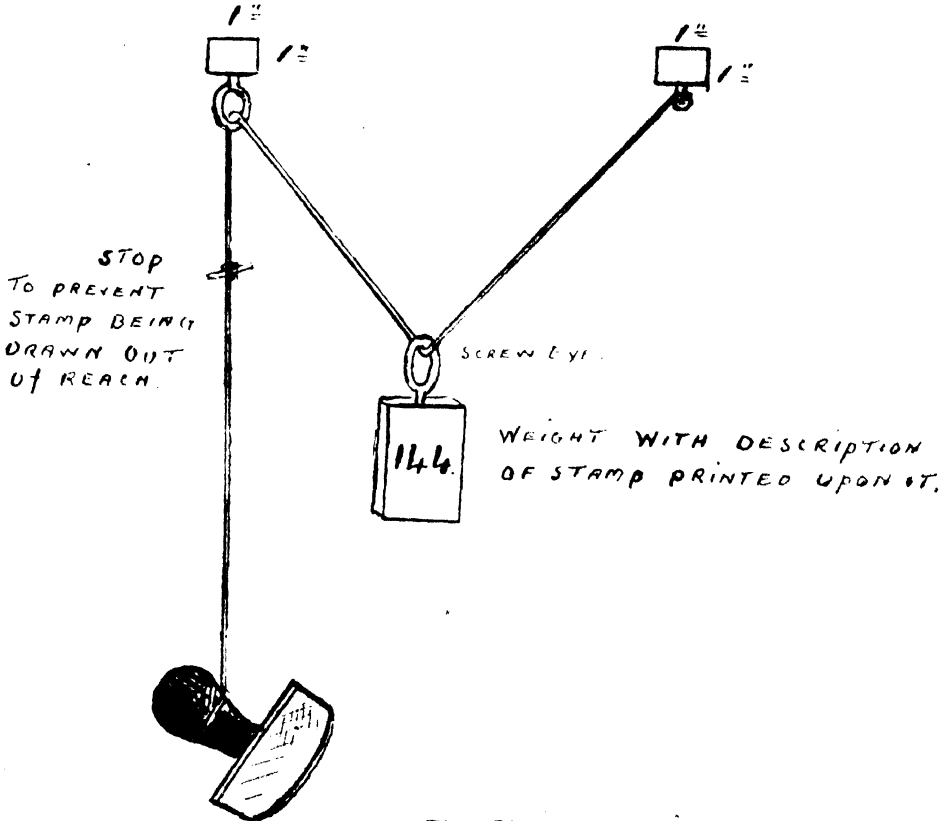


Plate 74.

METHOD OF ATTACHING RUBBER STAMPS TO HANG OVER PACKING BENCHES.

Rubber Stamps.

If rubber stamps are used instead of stencil plates they can be placed over the sizing machines and packing benches on weighted strings, so that the packers will have them in easy reach and when used they will rise out of the way of the packer until required again. Rubber stamps should always be made with a convex face (Plate 74), so that the stamp will print easily on the wooden end of cases. If made flat stamps will not print satisfactorily when slightly uneven ends are encountered.

Other necessary accessories for those sending fruit where it has to be handled more than once are wire-tying machines which save a lot of damage to cases. Corrugated case-end fasteners are also useful, repairs to split ends being quickly and neatly effected by this means. A time-saving implement for those who have a trade in small case lots and use tacks is a magazine label attacher. This will attach a label in one-tenth the time required with a hammer and tacks. The accessories described are necessary to all growers who desire to handle their fruit

in as quick and economical a way as possible, and they should materially help in putting up an article that will compete, both inside and out, with any other article on any market in a way that will be a credit to Australia.

Tomato Packing Shed Equipment.

Where growers have not a suitable mechanical sizer (most ordinary commercial sizing machines have very low efficiency for tomatoes) they will find it a great help if a multi-compartment, hand-sizing and packing bench is built as illustrated (Plate 75).

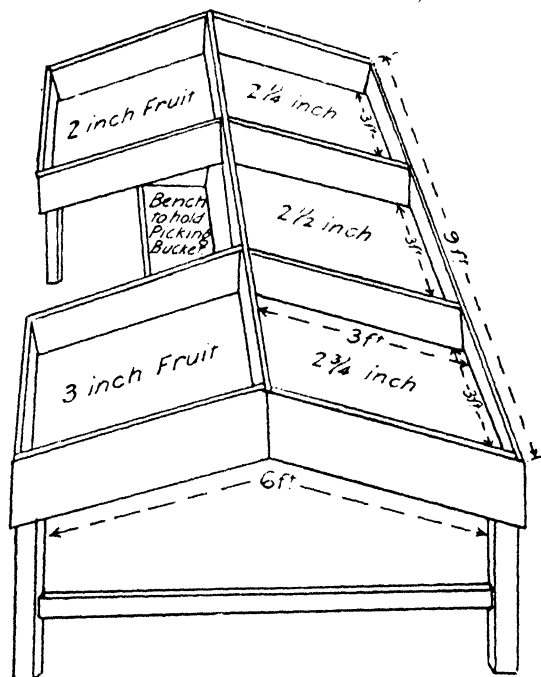


Plate 75.

SIZING TABLE.—Diagram of sizing table containing bins for five sizes of tomatoes, and a space with bench built in to accommodate sizing operative.

Note.—This table should not be made too big, as this will cause rough handling of fruit.

For the successful packing of tomatoes sizing is absolutely necessary, and must be done before proceeding to pack. It is possible with citrus, apples, or pears to pack without sizing first, but with tomatoes it is essential to size first. At present we do not know of any sizer that is a complete success for sizing tomatoes, but the revolving roller and moving belt type of appliance is a big help. The best method for the grower with a small acreage is a sizing table, a diagram of which is shown (Plate 75). This can easily be made at home. It is necessary to have the centre raised to allow the fruit to run to the edges of the table where the packers are working. This saves reaching for fruit. Packing operations are conducted from the sides of the bins or compartments of the table. To save throwing or rough handling on the part of the operator sizing the fruit, it is advisable not to make the table too big. Benches 3 feet by 3 feet are a good size; this would mean a table 9 feet long by 6 feet wide. There are five compartments for sizing, the space

in the middle at one side being used by the sizer to stand in whilst working. A bench for standing the packing bucket on is a great convenience and time saver—allowing the sizer to use both hands for operations. Best results will be obtained where it is possible always to have the sizing done by the same person, who will soon become very fast and expert. This bench, used in conjunction with case-making benches, &c. (Plates 67, 69, 70, 72) and other accessories described, will enable tomato-growers to accelerate greatly the speed of their output.

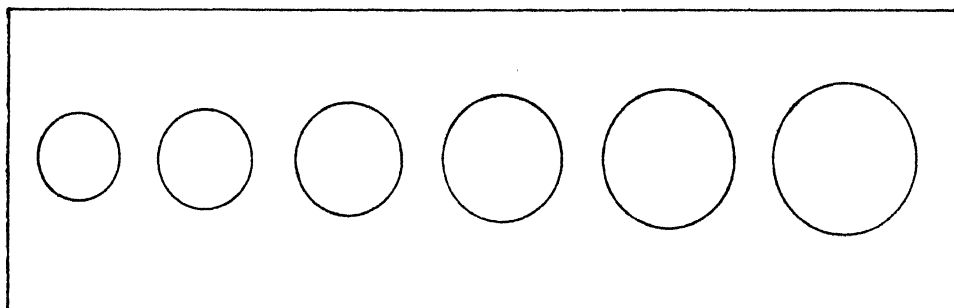


Plate 76.

HAND-SIZING GAUGE.—The holes can be cut in plywood with an expansion bit or washcutter, $1\frac{1}{2}$ inch being the distance of the edge of the 3-inch hole from the edge of the board with a distance of $1\frac{1}{2}$ inch between the edges of each hole.

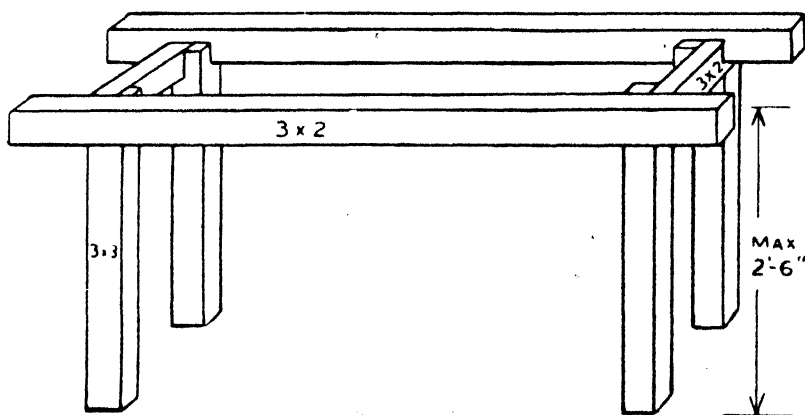


Plate 77.

NAILING-DOWN STAND SUITABLE FOR TOMATOES, PASSION FRUIT, PEACHES, AND SIMILAR FRUITS PACKED IN HALF-BUSHEL CASES.

Passion Fruit Shed Equipment.

The same case-making benches as used for citrus, stone fruits, &c., may be used for the making up of passion fruit cases, but the addition of a nailing-down stand in the shed is helpful in making the work easier. This stand can be made any length to suit the particular

activities of the grower. A study of the illustration in Plate 77 is all that is necessary to enable the stand to be built. The case supports should be placed approximately 16 inches apart. This will permit the bottom of the case to bulge slightly when the case is nailed down.

Home-made Sizing Machine.

Anybody able to use tools will find no difficulties in making the suggested sizer. The sizer is of a semi-gravity type, the rollers being placed in an inclined position to assist the fruit in running over the rollers. The fruit is fed on to the highest end of the rollers. These are placed with the ends receiving the fruit close together, the rollers being so adjusted that the space between gradually widens as it reaches the opposite ends. In operation the smallest fruit drops through first, the large sizes having to run down the roller before the space becomes wide enough to permit it to fall through into the receiving bins. As the incline on the rollers is insufficient for the fruit to travel without assistance a spiral worm of rubber is placed on each roller to assist the fruit from one end to the other. An examination of the diagram (Plates 78 and 79) will show the principles of construction of the sizing unit. The following materials will be necessary for a machine with 9-foot rollers:—

One flywheel (D), approximately 12 inches in diameter.

Two gear wheels (H), approximately 5 inches in diameter with $\frac{1}{2}$ -inch mesh for gears.

Four short lengths of shafting, 3 lengths 9 inches long, 1 length 12 inches long. (The gear wheels and flywheel are to be mounted on the shafting for driving purposes.)

Four bearings (E). (These are not necessary if hand power only is to be used, wooden bearings then being suitable.)

Two wooden rollers (A), 9 feet x $3\frac{1}{2}$ to 4 inches in diameter. (A shorter length can be used for a smaller machine.)

Sufficient $\frac{1}{2}$ -inch thick sheet sponge rubber to completely cover the rollers and make the spiral drive on each roller.

Eight bolts, $\frac{1}{2}$ -inch x 5 inches for mounting bearings.

The following timber is necessary to construct sizing unit only:—

Two pieces for placing on each side of the roller (B Plate 8) 9 feet 2 inches x 6 inches x $\frac{1}{2}$ -inch boards. (To be 2 inches longer than the rollers, to allow for fastening.)

Two pieces for mounting bearings, each 12 inches, 3 inches x 3 inches.

Two pieces for centre uprights to mount unit on.

One piece for stay between unit uprights, 10 feet, 3 inches x 2 inches.

The unit can be fitted with either single or double-sided bins. The bins can be made in size to suit the operations of each individual grower. They are easily built on to the unit using the end uprights as centre legs at either end. As the feed of sized fruit is at the centre between the rollers, no difficulty should be experienced in running the sized fruit to either side of the machine ready for packing. A study of Plate 9 will show the method of building the double-sided machine. A single-sided machine presents no difficulties to the builder.

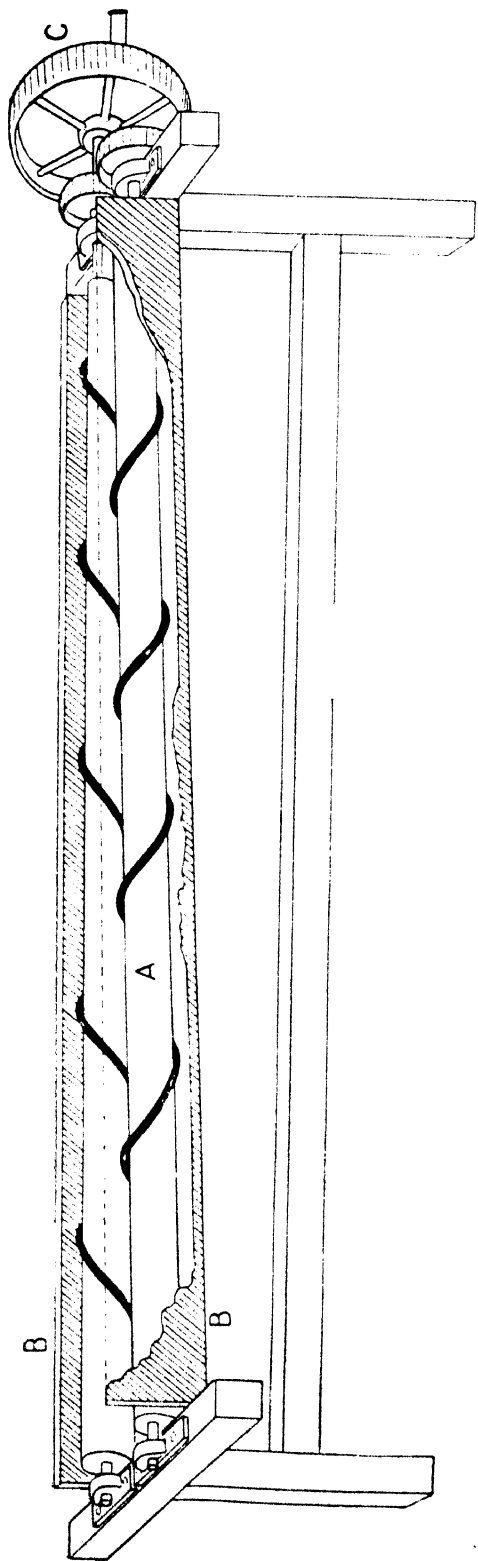
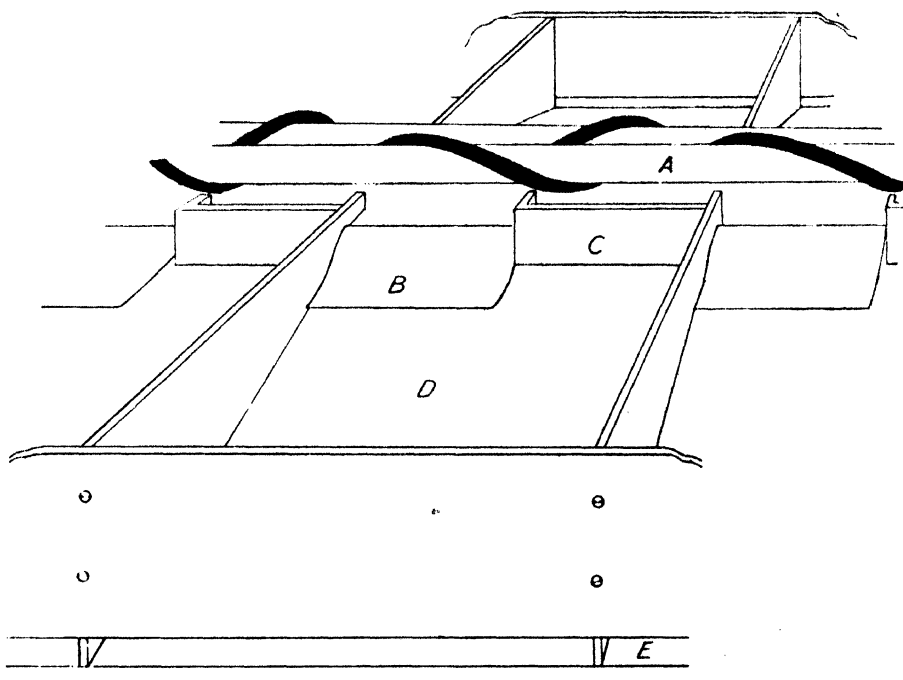


Plate 79.
MECHANICAL SIZING MACHINE FOR PASSION FRUIT SHOWING SIZING UNIT ONLY.
A. Sponge rubber-covered wooden rollers.
B. Two 6-inch by 1-inch boards on outside of rollers to prevent fruit
from running off rollers.
C. Flywheel and handle.

When building the unit for greatest efficiency the rollers should be made adjustable. This is easily accomplished. One roller is fixed permanently; this should be the roller with the flywheel attached. The adjustable roller is bolted closely at the flywheel end, and is made adjustable at the opposite end by slotting the bearing mounting. This enables the space between the rollers to be adjusted by sliding the end of one roller closer or further away from the other as needed. (See E, Plate 78).



- A. Section of sizing rollers.
- B. Canvas flap to guide fruit into bin on near side of rollers.
- C. Wooden back of canvas flap for guiding fruit into bin on far side of rollers.
- D. Bottom of bin. This can be made by placing canvas or hessian over fine mesh wire.
- E. Half-inch gap between side and bottom edge of bin. This enables the bins to be cleaned easily of all stalks and old leaves, &c.

Plate 80.

Section of bins on a double-sided machine, showing method of feeding fruit to each side of rollers.

Banana Packing Equipment.

In these days of knife shortages a useful dehanding knife can be made by attaching an old hack-saw blade to a wooden handle. This is done by attaching pieces of suitably shaped wood to each side of the blade, the whole being riveted together by using three flat-headed nails as rivets (Plate 81). The teeth of the saw are then ground off and the blade shaped and sharpened.

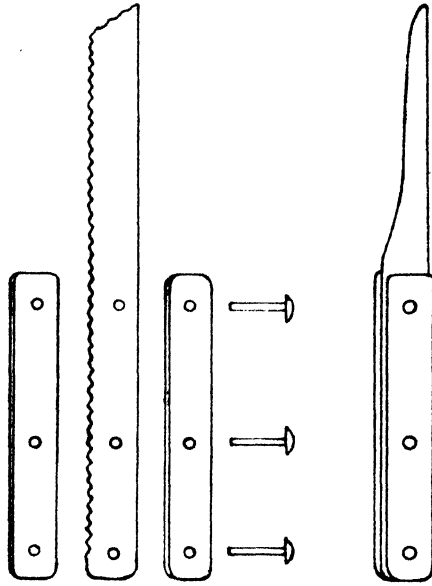


Plate 81.
HOME-MADE KNIFE WITH SHAPED BLADE.

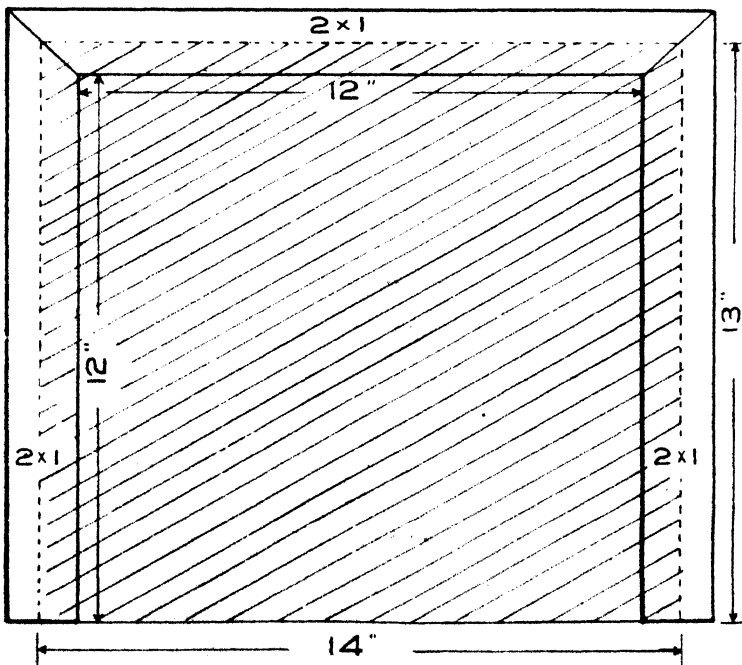


Plate 82.

NAIL CLINCHER AND TEMPLATE can be made separately or fitted to the case-making bench.—The dotted line enclosing the shaded portion shows the shape of the piece of sheet iron. Invaluable for joining two piece ends when making banana and other cases.

The materials required are—

- 2 pieces wood 2 inches x 1 inch, 14 inches long;
- 1 piece wood 2 inches x 1 inch, 16 inches long;
- 1 piece sheet iron 14 inches x 13 inches x $\frac{1}{8}$ inch;
- and necessary nails.

Nail Clincher and Template.

For growers using the tropical fruit case, where a two-piece cleated end is usually provided, it will be found that much time will be saved by adding this small piece of equipment to the packing house. Ends will also be more easily made square, and, what is of utmost importance, will also be of the correct size. The attachment can be built on to the centre of the case-making bench, using one of the inside case end supports as one side of the template.

Where growers have to use two pieces of cleated timber for the ends of bushel cases, the same idea would be found advantageous, the dimensions of the piece of iron being altered to suit the type of case to be used.

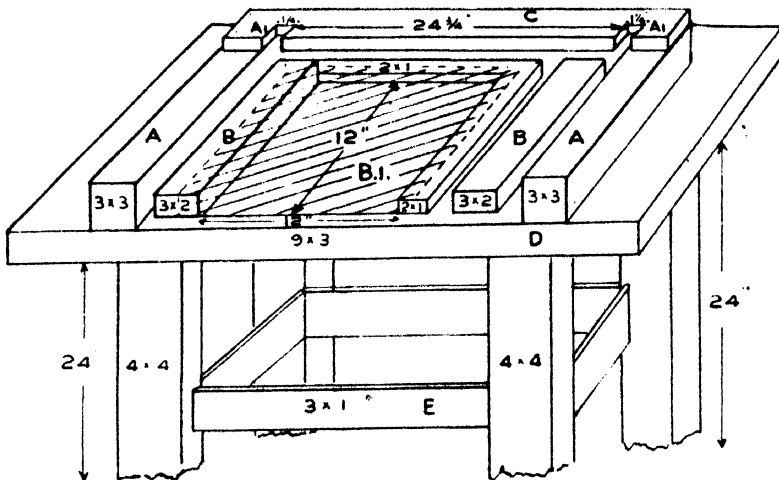


Plate 83.

BANANA CASE-MAKING BENCH, SHOWING METHOD OF ATTACHING CASE-END, TEMPLATE, AND NAIL CLINCHER.

Specifications.

Length:—42-50 inches;

Height:—(Underside of top), 24 inches;

Width:—24 inches;

Template:—As described (Plate 82).

Timber:—Legs, 4 inches x 4 inches;

Stops:—(A) Outside, 3 inches x 3 inches x 13½ inches;

(B) Inside, 3 inches x 2 inches x 12 inches;

(C) Back, 3 inches x 1 inch x 34 inches;

Top:—(D) 3 pieces 8 inches x 3 inches x desired length;

Stays:—(E) 3 inches x 1 inch.

Description.

The stops (A) and (B) are placed approximately 1½ inches apart, with the back stop (C) placed across the back ends of (A) and (B). A cut 1 inch deep and 1½ inches wide is made in the back stop to correspond with the slot between (A) and (B). The back end of this cut should be 12 inches from the front of the bench. The inside stop (B) is placed ½ inch from the front edge.

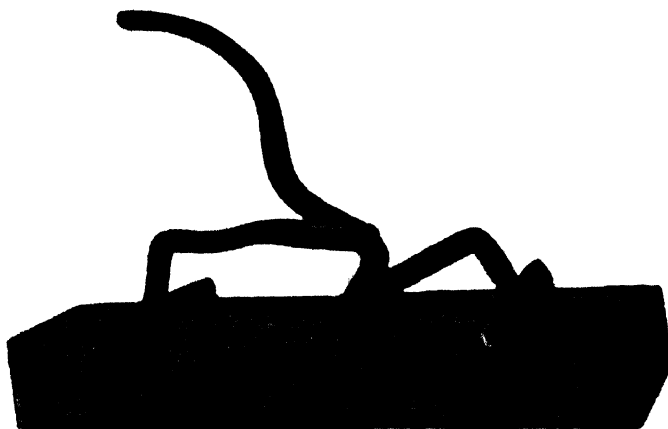


Plate 84.

AN IRON NAILING DOWN CLAMP, CAN BE MADE FOR A FEW SHILLINGS BY ANY BLACKSMITH.

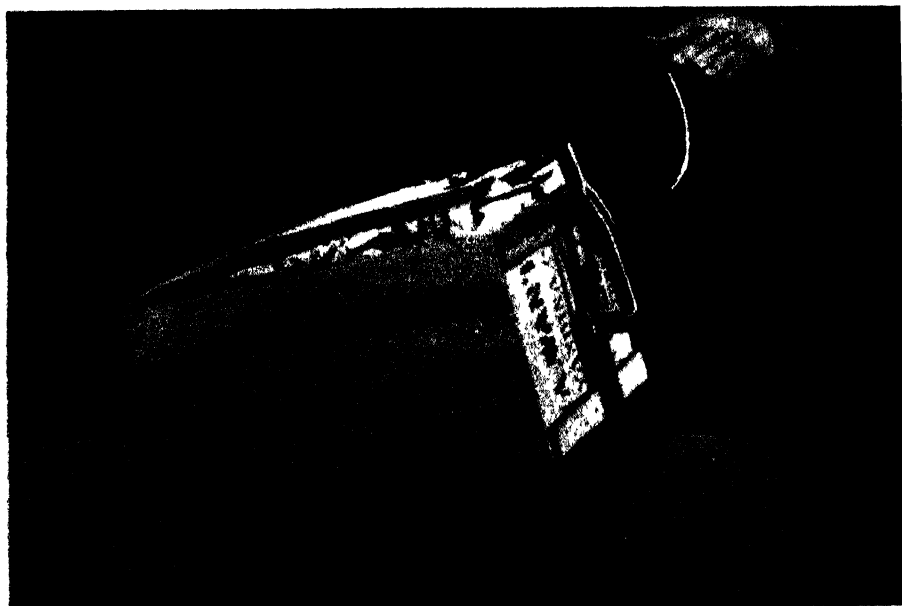


Plate 85.

USING THE CLAMP. CLAMP IN POSITION BEFORE APPLYING PRESSURE.

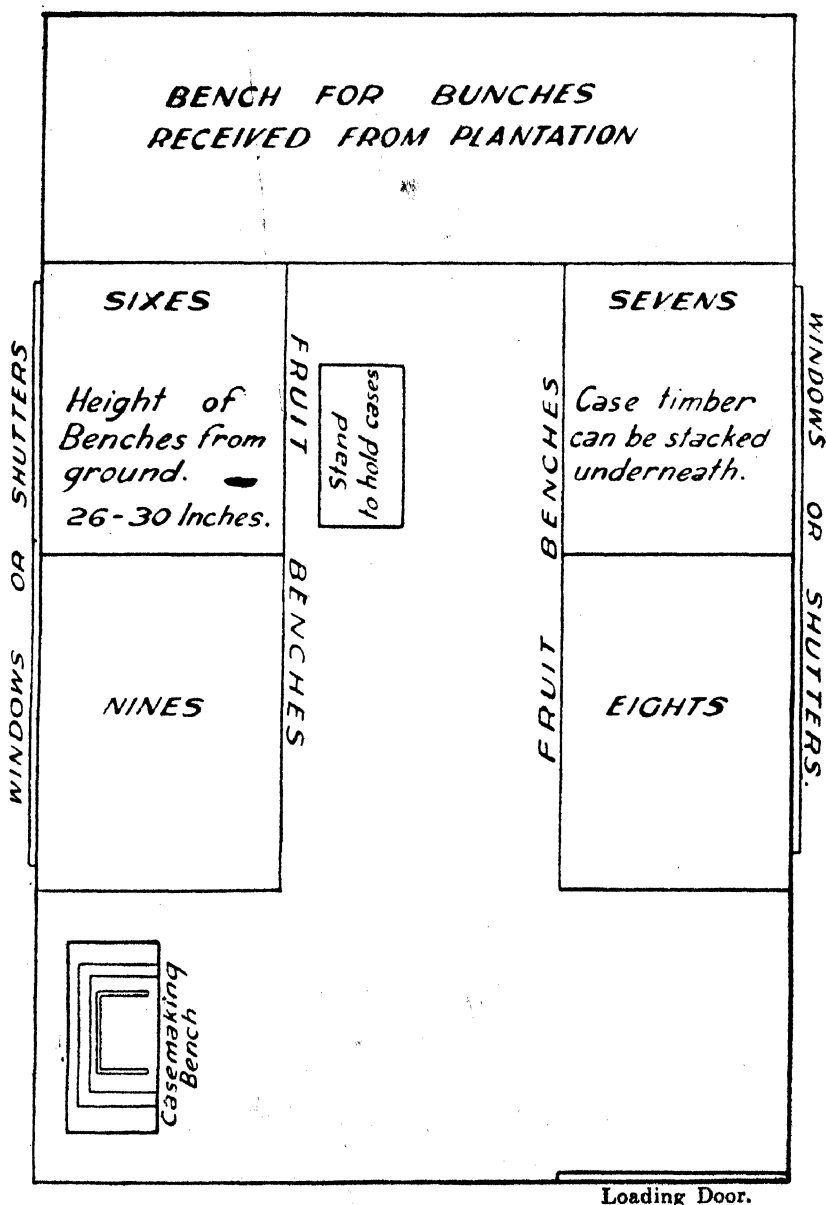


Plate 86.

SUGGESTED LAYOUT OF A BANANA PACKING SHED.—Many banana growers would ease and greatly increase the speed of their work if they designed a convenient layout for their packing shed.

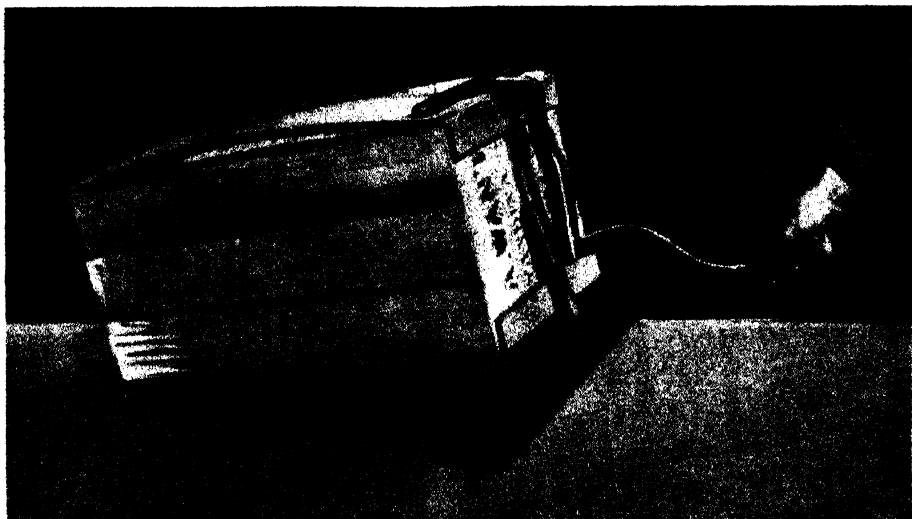


Plate 87.

PRESSURE APPLIED TO LID SHOWING LID IN POSITION READY FOR NAILING.



Plate 88.

ANOTHER TYPE OF IRON CLAMP SHOWING CLAMP READY TO APPLY THE PRESSURE TO THE LID.

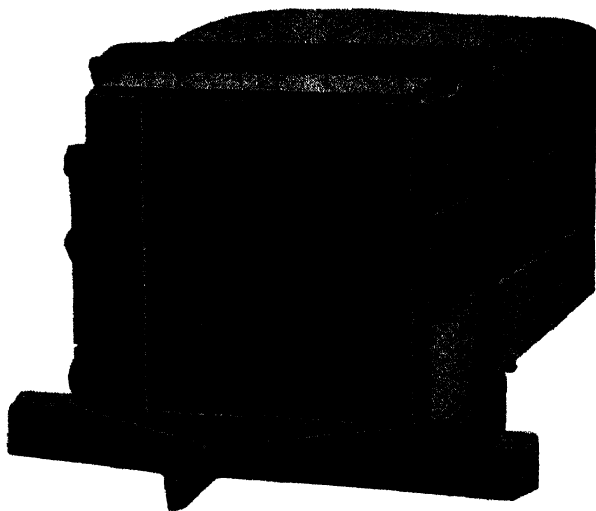


Plate 89.

PRESSURE APPLIED. LID READY FOR NAILING.

NAILING-DOWN CLAMPS OR LIDDING PRESSES.

There are many types of nailing-down clamps, mostly home-made, but none the less effective. Those illustrated (Plates 84 to 94) can easily be made at home or by the local blacksmith. A study of the illustrations will show the designs. The jaws when shut should be approximately

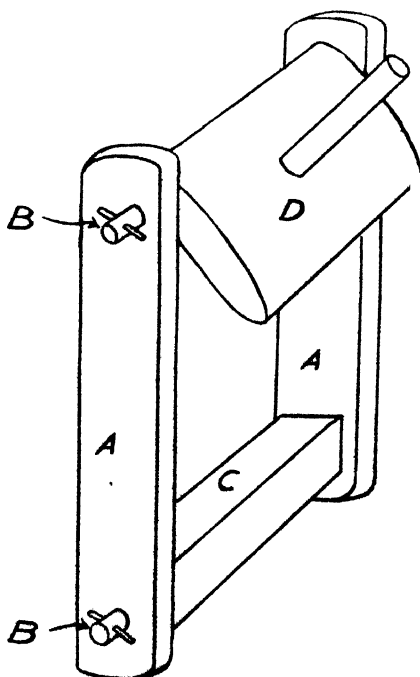


Plate 90.

HOME-MADE WOODEN CASE LIDDING PRESS.

12½ inches apart (Plates 85 to 89). A simple clamp made of timber also works quite satisfactorily (Plate 90).

This press is easy to make and simple to use. The following timber is needed:—

2 pieces 4 inches by 2 inches by approximately 28 inches long for side pieces;

1 piece 3 inches by 3 inches by 13½ inches long for base block;

1 piece 8 inches by 1½ inches by 13½ inches long for pressure unit;

1 piece broom handle 12 inches long for handle of pressure unit;

4 pivots (pieces of broom handle) for pressure unit and base block;

4 pegs or pins to place on the outside of side pieces.

The side pieces (A) are drilled to take the broom handle pivots (B), which are placed in the ends of the base block (C) and pressure unit (D). The holes should be drilled so as to permit the bottom of the pressure unit and the top of the base block to be 12½ inches apart (see Plate 92).

The pressure unit is made by taking the 8 inch by 1½ inch by 13½ inch piece of timber and rounding one edge. This is the bottom edge which comes in contact with the box lid while pressing. The board is drilled at the opposite edge to take the pivots, one being inserted at either end about 1½ inches from the top edge. The lever is inserted in the middle of the board 3½ inches from the top edge.

The base block of 3 inches by 3 inches timber is made by inserting two pivots into the ends. The pivots should be approximately 6 inches long, and be inserted at least 2 inches into the pressure unit and base block.

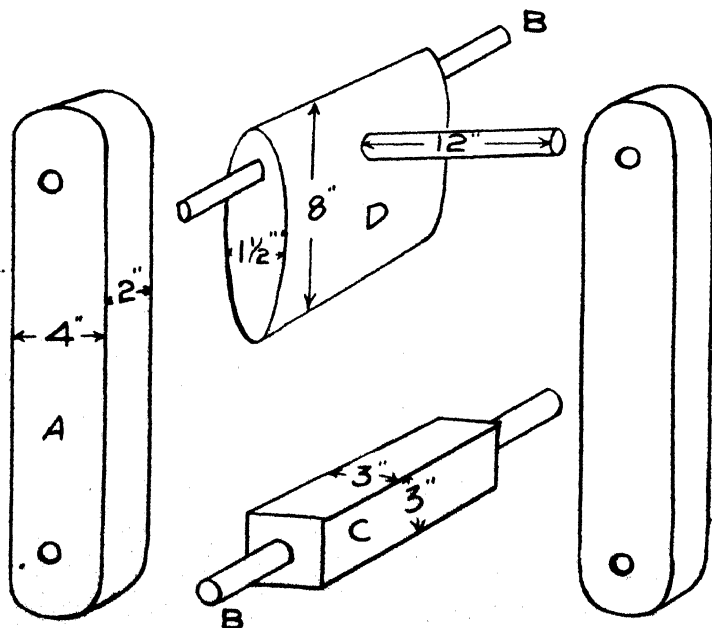


Plate 91.

THE LUDDING PRESS BEFORE ASSEMBLY.

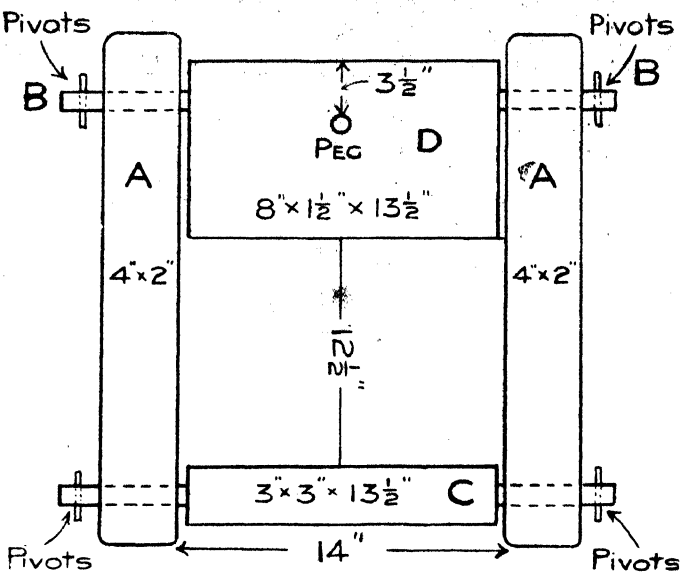


Plate 92.
FRONT VIEW OF ASSEMBLED LIDDING PRESS.

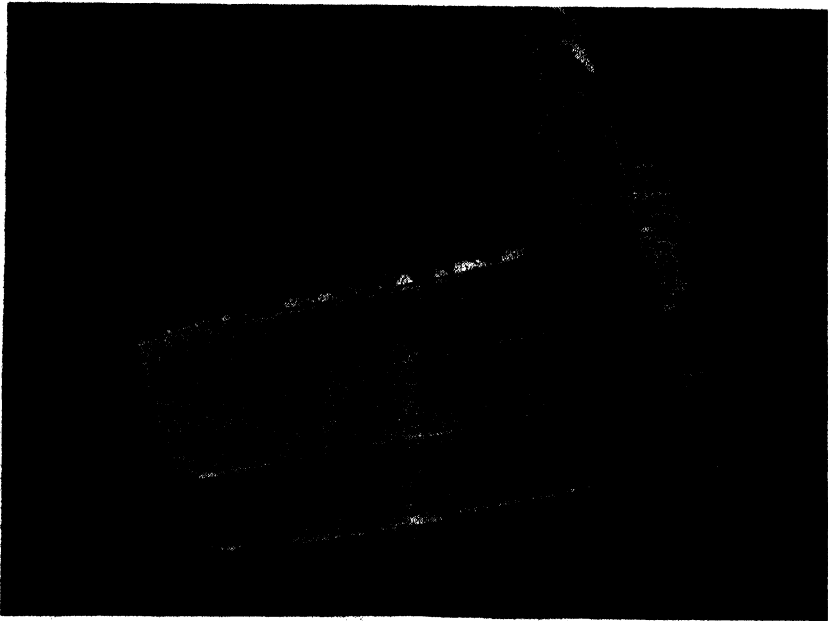


Plate 93.
WOODEN LIDDING PRESS BEFORE APPLYING PRESSURE TO LID.

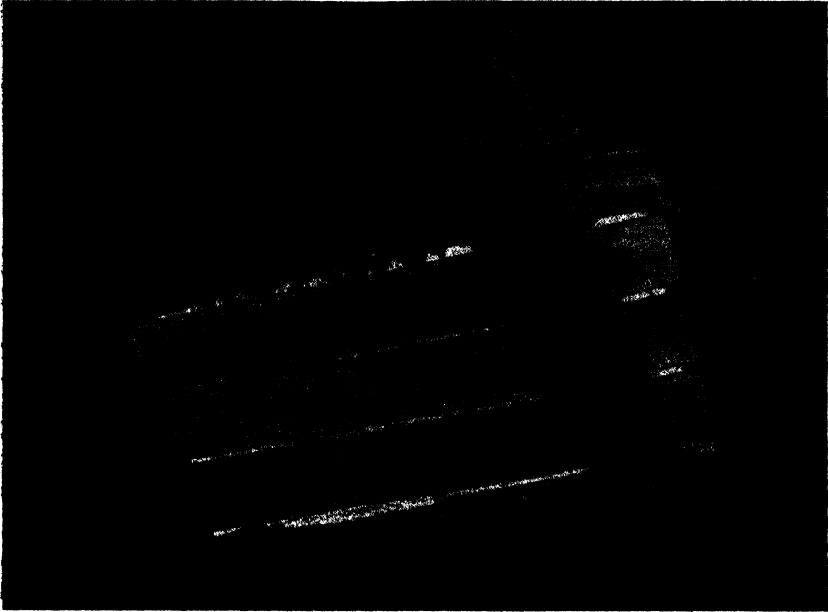


Plate 94.

WOODEN LIDDING PRESS WITH PRESSURE APPLIED.

A Handy Picking Tray Holder for Strawberry Growers.

For the small farm the picking tray holder unit illustrated will be found most useful. Easy to make, it will pay for itself many times over.

Whilst the tools and gadgets illustrated are excellent in operation, growers are advised that it is not intended to suggest that they should replace commercial tools when these are more readily available.

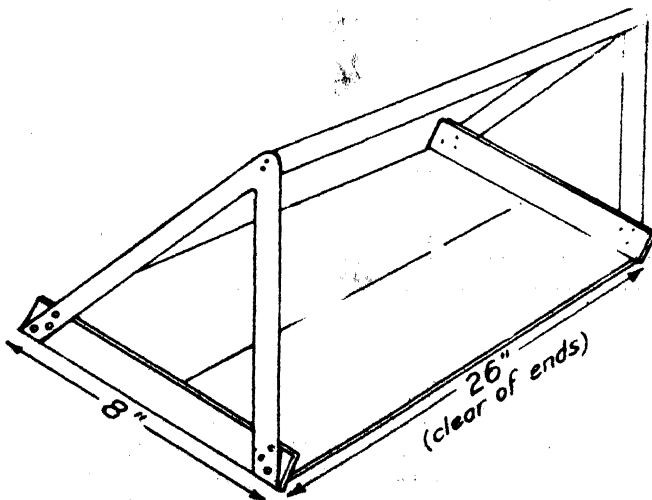


Plate 95.

Ends: 2 pieces 8 inches x 2 inches x $\frac{1}{2}$ inch.

Bottom: 2 pieces 27 inches x 4 inches x $\frac{1}{2}$ inch (minimum).

Handle: 27 inches. Length of broom handle with suitable supports to suit picker.

Vegetable Production

Vegetable Seed Contracts.

The Department of Agriculture and Stock has been advised by the Commonwealth Vegetable Seeds Committee that it desires to arrange contracts with producers in Queensland for the production of certain acreages of vegetable seeds. The varieties, acreages required, and the price payable for seed, are shown in the following table. Growers who are interested and wish to make a contract, are asked to communicate with the Under Secretary, Department of Agriculture and Stock, Brisbane, without delay.

Variety.	Aeres.	Price.
BEANS (FRENCH)—		Bushel.
Brown Beauty	79	80s.
Canadian Wonder	18	80s.
Epicure	15	80s.
Feltham Prolific	15	80s.
CORN (SWEET)—		
Country Gentleman	10	25s.
Golden Bantam	3	25s.
Golden Sunshine	25	25s.
Hybrid	93	50s.
CUCUMBER—		Lb.
Early Fortune	5	6s.
Kirby's Staygreen	2	6s.
MELON (ROCK)—		
Powdered Mildew Resistant No. 45	5	7s. 6d.
MELON (WATER)—		
Hawkesbury Wilt Resistant	1	6s.
PUMPKIN—		
Queensland Blue	51	6s.
Triamble	26	7s. 6d.

WATER MEASUREMENTS

One gallon = 277 cubic inches = 10 lb.

One pint (fresh) = 1½ lb. (approx.).

6½ gallons = 1 cubic foot = 1,000 ounces.

1 cubic foot = 62½ lb.

11 gallons = 1 cwt.

224 gallons = 1 ton.

The United States gallon = .883 Imperial gallon.

APPLIED BOTANY

Gomphrena Weed.*

C. T. WHITE, Government Botanist.

DURING the past summer a great number of specimens of Gomphrena Weed have been received from pastoralists and farmers for identification and report. Many have feared that it might become a very serious pest in the same way as the Khaki Weed, to which it is closely allied. So far as observed, however, the plant does not seem to be very difficult of eradication and has not proved particularly aggressive.

It belongs to a wholesome family (Amarantaceae) but does not seem to be eaten by stock to any extent, though one or two reports have been received from the country to the effect that once stock acquire a taste for it they eat it readily enough. It is not known to possess any poisonous or harmful properties. It is a native of tropical America and first made its appearance about Townsville some fifteen years ago. Since then it has spread along the whole of the coastal belt and quite some distance inland. In the more inland localities it seems to favour a sandy soil.

To enable farmers and pastoralists to identify it the plant may be described as an erect, much-branched annual herb mostly about one foot to eighteen inches high with a fairly stout taproot and often rooting at the lowermost nodes. Sometimes the stems lie flat on the ground, especially when eaten or trampled down by stock. The flowers are white, borne at first in round heads about half an inch across, which as they grow older lengthen in seed to spikes about two inches long. The seeds are borne in great abundance, are dark chestnut brown, smooth and rather shiny.

* *Gomphrena decumbens*.

ANSWERS.

(Selected from the Government Botanist's outward mail.)

Johnson Grass.

R.H. (Murphy's Creek)—

The specimen is the Johnson grass (*Sorghum halepense*), widely spread as a weed over most warm countries. It is very frequently found in cultivations in parts of Queensland and is very difficult to eradicate because every small piece of the underground portion cut with a spade or plough is capable of forming a new plant. If there is only a small patch it would be advisable to eradicate it carefully and kill the underground parts by exposure to the sun.

The grass is quite a good fodder, but like most of the *Sorghum* family contains a prussic acid yielding glucoside; therefore, care must be exercised in feeding it to stock. The safest thing to do is to cut it when in seed head and allow it to wilt a little time before feeding. Hungry cattle should not be allowed to gorge themselves on it. Provided these reasonable precautions are taken the plant is quite safe.



Plate 96.

GOMPHRENA WEED.

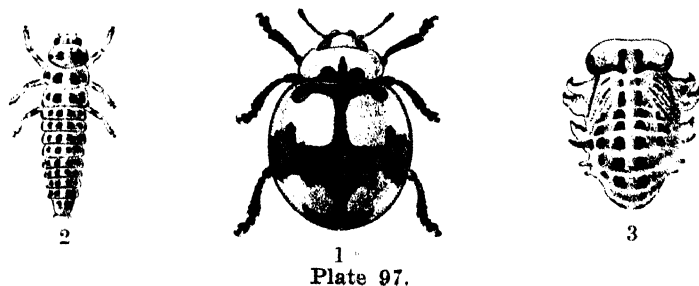
PLANT PROTECTION

Ladybird Beetles.

J. HAROLD SMITH, Senior Research Officer.

AMONG the useful insects on the farm and in the orchard, none are better known than the ladybird beetles or Coccinellids which occur on plants infested by scale insects, aphids, or mealy bugs. They are relatively small, round to oval beetles with the head fitting snugly to the rest of the body. The largest does not exceed three-eighths of an inch in length and the smallest is little more than the size of a pin head. Some are steely-blue in colour, others are brown or black with a regular colour pattern of red or yellow spots. The better-known species, however, are yellow with black spots, blotches, or stripes on the wing covers.

Australia has more than 250 different species of ladybird beetles. The richness of the fauna may be due to the ample food supplied to the beetles by the numerous indigenous scale and lerp insects occurring on native trees, shrubs, herbaceous plants, and grasses. Few ladybirds feed on only a single species of insect, and it is not surprising, therefore, that scale insect, mealy bug, and aphid colonies on cultivated fruit trees and farm crops have invariably one or more of these useful predators associated with them. Though best known as enemies of scale insects, mealy bugs and aphids, some ladybirds prefer the minute white flies and lerp insects seen on cultivated and native plants, while a few subsist almost entirely on fungi (Plate 97).



A FUNGUS EATING LADYBIRD (*Halysia galbula* Muls.).

Fig. 1.—Adult beetle x 5.

Fig. 2.—Larva x 5.

Fig. 3.—Pupa x 5.

[Drawings by William Mantey.]

LIFE HISTORY AND HABITS.

The life history of the spotted ladybird* is more or less typical of all these beetles. This yellow insect (Plate 98; fig. 1) is about one-third of an inch long and has four transverse rows of black spots on the wing covers. It feeds on many species of aphids, but is, perhaps, most common during the spring and summer months on deciduous fruit trees, such as

* *Harmonia conformis* Boisd.

the apple, which frequently carry large populations of the woolly apple aphid. The bright-yellow, elongate-oval eggs are laid on end in clusters of thirty or thereabouts in and among aphid colonies on the plant. After three to six days, these eggs hatch and from them emerge minute, smoky-black larvæ which immediately begin to feed on the aphids. These may be consumed whole or simply torn apart and sucked dry, the mode of attack depending on the age of the aphid and the capacity of the larva to eat the harder parts of the host's body. As the larva moults and grows, a broad, yellow band appears on the abdomen, the surface of which acquires a somewhat warty appearance. During the larval stage 200 to 500 aphids may be destroyed. About two weeks after emerging from the egg the larva, then about one-half of an inch long and full-grown, seeks a sheltered spot on the stem or leaf of the plant and attaches itself to the surface just before pupating. This change to a quiescent, non-feeding stage takes place in a head-downward position, the shape of the pupa being more round than that of the larva but less round than that of the adult beetle. Four to six days later the adult beetle escapes from the pupa through a large T-shaped split in the skin. Like the larva, the beetle feeds on the aphids continually during its life of four to six weeks and is probably equally important in their destruction.

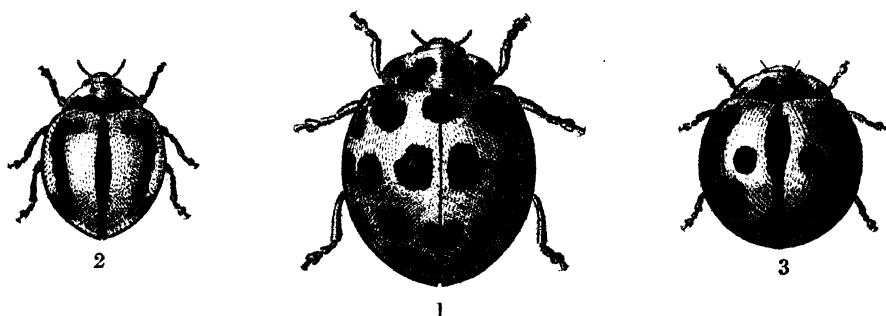


Plate 98.

LADYBIRD BEETLES PREDATORY ON APHIDS.

Fig. 1.—The spotted ladybird (*Harmonia conformis* Boisid.) x 5.

Fig. 2.—The striped ladybird (*Verania frenata* Er.) x 5.

Fig. 3.—*Coclophora inequalis* Fab. x 5.

[Drawings by William Manley.]

The foregoing account of the life history of the spotted ladybird applies to most aphid-feeding species but differs in some details from the habits of those which feed on other insects. Ladybird beetles which attack scale insects and mealy bugs may lay their eggs singly, and these are white or orange in colour and less elongate in shape than in the aphid-feeding species. The larvæ also vary a great deal. Most of the aphid and hard-scale feeding larvæ are similar in appearance to those of the spotted ladybird described above—i.e., smoky-black in colour with yellow markings. Those of species which attack mealy bugs or fluted scales may be clothed with a mealy covering supplemented by an ornate arrangement of white wax filaments or plates which give them a superficial resemblance to the insects on which they feed. A few do not pupate on the plants but seek shelter under trash at ground level; others come together in the later larval stages and pupate in large colonies on the trunks of trees or on the ground.

One curious feature of some ladybird beetles, exemplified by certain Queensland species, is the tendency of the adults to congregate in large

numbers. One species, the striped ladybird* (Plate 98; fig. 2) a small yellow insect with a black, dumbbell-shaped marking on each wing cover, feeds on aphids in the axils of maize, sorghum, and sugar-cane during the summer months. During autumn, winter, and spring adults occur in millions, sometimes clustered on a single tree in an orchard, sometimes thickly dispersed over an acre or so of herbage. These swarms are occasionally so dense that the plants on which they rest assume a drooping appearance. Ladybird beetles when behaving in this way consume little, if any, food, though they do sometimes enter flowers and cause premature petal-fall. Such swarms may occur almost anywhere—on inhospitable sand dunes, in timbered areas, and even in the suburbs of a city without any obvious proximity to agricultural areas where they might have been active during the summer months. The phenomenon is apparently an expression of hibernating tendencies stimulated by impulses about which little is known.

THE VALUE OF LADYBIRD BEETLES.

Like most predators, ladybird beetles breed more slowly than the insects on which they feed, and seldom appear in numbers until large populations of scale insects, mealy bugs or aphids are already on, and damaging, crops. Over a period of three or four weeks, however, the position may change considerably as the predator becomes sufficiently numerous, first to check the pest, and, later, to reduce its numbers to levels at which it is of little or no importance to the farmer. There is thus a constant fluctuation in the populations of pest and predator—first one is dominant and then the other. The frequent time lag before the ladybird beetles become numerous enough to check the pest is also due, in part, to the activity of some small wasps and flies which parasitize the egg, larval or pupal stages of the ladybird itself and slow down its normal rate of increase. Nevertheless, in spite of these handicaps, ladybird beetles invariably curb the activities of the insects on which they feed, though they limit the scope, rather than prevent the occurrence, of pest outbreaks.

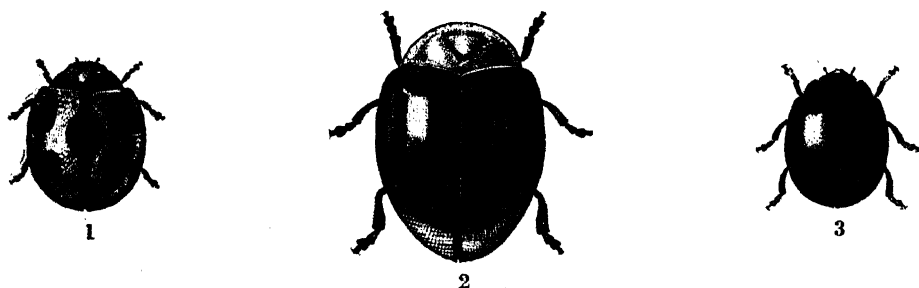


Plate 99.

PREDATORY LADYBIRD BEETLES.

Fig. 1.—*Rodolia cardinalis* Muls. x 5; predatory on cottony cushion scale.

Fig. 2.—*Cryptolaemus montrouzieri* Muls. x 5; predatory on mealy bugs.

Fig. 3.—*Rhizobius ventralis* Er. x. 5; predatory on hard scales.

[Drawings by William Manley.

Ladybird beetles seldom receive due credit for the good work they do, though their value is well illustrated by the fact that some pests of quite minor importance in Australia have, when inadvertently introduced to other countries, threatened the extinction of established agricul-

* *Verania frenata* Fab.

tural industries until their ladybird associates were also introduced to exercise control. It is not surprising, therefore, that overseas entomologists concerned with finding ways and means of keeping pests in check have given a great deal of attention to ladybird beetles in this country. Several species have been collected from time to time, shipped to other countries, and released in areas where the insects on which they feed are injurious to crops. Directly or indirectly, such importations have been so widespread that one or more Australian ladybird beetles are now established in most tropical and sub-tropical countries. The three best known of these are the *Icerya* ladybird,* a very small black and red species (Plate 99; fig. 1) which feeds on the cottony cushion scale, the mealy bug ladybird,† a blue beetle with red-tipped wings and head (Plate 99; fig. 2) which destroys mealy bugs, and the small dark-brown *Rhizobius* ladybird‡ (Plate 99; fig. 3) which attacks some hard-shelled scales on forest trees.

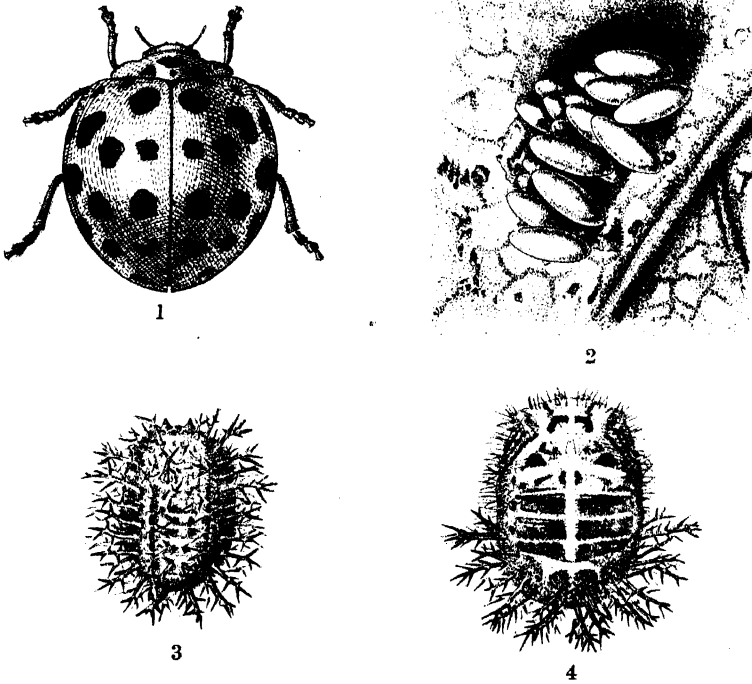


Plate 100.

THE LEAF-EATING LADYBIRD (*Epilachna 28-punctata* Fab.).

Fig. 1.—Adult beetle x 5.

Fig. 2.—Egg mass x 5.

Fig. 3.—Larva x 5.

Fig. 4.—Pupa x 5.

[Drawings by William Manley.]

PLANT-FEEDING LADYBIRD BEETLES.

Curiously enough, one of the better-known ladybird beetles, the leaf-eating ladybird,|| is not predatory on other insects; it is, in fact, a serious pest of pumpkins, melons, cucumbers, and similar crops. Occasionally,

* *Bodolia cardinalis* Muls.† *Cryptolaemus montrouzieri* Muls.‡ *Rhizobius ventralis* Erich.|| *Epilachna 28-punctata* Fab.

too, it attacks potatoes, tomatoes, and a few related weeds. There is frequently some confusion between this insect and the spotted ladybird which attacks aphids and is a useful predator. Both have much the same general appearance and colour, but the leaf-eating ladybird can be distinguished from all other species by the twenty-eight black spots on the wing covers (Plate 100; fig. 1). The spotted ladybird has approximately eighteen and the larvæ of the two insects are quite different. Those of the leaf-eating ladybird are sluggish in habit, and their yellow bodies bear a considerable number of dark-coloured, branched spines (Plate 100; fig. 3); those of the spotted ladybird are, as described earlier, smoky-black in colour and very active.

SEED INOCULATION OF LUCERNE AND OTHER LEGUMES.

During the autumn months many farmers will be sowing land to leguminous plants such as lucerne, lupins, clovers, field peas, and vetches. It is desirable that seeds of these plants be treated with special bacterial cultures in order to ensure that the bacteria necessary for the best development of the plants are present in the soil.

The bacteria required by plants of the legume family occur in healthy, vigorous plants in root swellings known as nodules. Within the nodules the bacteria absorb nitrogen from the air in the soil and convert it into a form of nitrogen which can be used by the plant for growth. Plants other than legumes, and legumes from which the nodule bacteria are absent, must obtain their nitrogen from nitrogen-containing substances in the soil, and often these are not plentiful. The presence of the appropriate bacteria therefore gives leguminous plants a decided advantage over other plants, and this advantage is lost when the bacteria are absent from the soil.

In all cases where new land is being sown to a leguminous plant—lucerne, lupin, clover, vetch, field pea, cowpea, soybean, &c.—it is highly desirable that only inoculated seed be sown. Further, even if the land has borne a fairly good crop of the same or another legume there is no reason to assume that the most efficient type of bacteria is already present in the soil. Consequently, inoculation of seed with proven efficient bacteria is usually well worth while whenever leguminous crops are to be sown.

The Department of Agriculture and Stock prepares bacterial cultures suitable for all legumes commonly planted in Queensland. These are available at a charge of one shilling per bottle. The material in a bottle is sufficient to treat up to 60 lb. of large seeds, such as cowpeas, or 30 lb. of smaller seeds, such as lucerne. Briefly, the inoculation process consists of sprinkling the seeds with skim milk to which the bacterial slime in the bottle has been added. The seed is allowed to dry and is then sown in the usual manner.

Farmers requiring cultures should write about a fortnight before the expected planting date, indicating the variety and amount of seed to be treated.

—T. McK.



Fat Lamb and the Food Problem.

THIS is an appeal to Queensland fat lamb producers to produce more lambs and better lambs. There are three main ways in which this very desirable increase may be brought about. The first, of course, applies to numbers. More ewes should be mated, and this demands, secondly, an increase in suitable cultivation for the purpose. Thirdly, in the special circumstances of war now prevailing, lambs should be held longer than usual, with the object of increasing the individual weights by at least 10 lb. It is estimated that growers who usually turn off lambs at 12 to 13 weeks old may achieve this object by holding the lambs for another month. It is important that not only should the weight be increased, but also that condition should be maintained. Growers may rest assured that the price paid for the heavier lamb desired will not be reduced on the per lb. basis, provided always that the lambs are truly fat.

Everything on the land eventually comes to a matter of pounds, shillings, and pence, and where could a quicker or better return be looked for in the sheep industry? The ceiling price, which all should strive for, is adequate for the grower, while within the capacity of the consumer to pay for first quality meat.

Cultivation may be regarded as essential in fat lamb raising. First class lambs have been produced on grass lands during favourable seasons, but as an exception and not as a rule, and disappointments have been so many that growers are advised to abandon the idea of production without cultivation.

Cereals as Sheep Feed.

All the cereals make first-class feed for ewes and lambs. If seasonal conditions are favourable, the grower may harvest a crop, too, in addition to feeding his flock. Care should be taken, however, not to put stock on to cereal crops until the plants are firm in the soil, if a harvest is desired. Some of the dwarf sorghums are fast gaining in favour as a feed for ewes and lambs. The carrying capacity of these sorghums is very great and, sown in conjunction with cereals and with the right date spacing, provide succulent feed for practically throughout the year. Lucerne, an excellent fodder for ewes and lambs, should be used to a much greater extent than it is. The establishment of a lucerne crop is admittedly costly, but after the initial expense the crop will last for years with anything like ordinary care.

The Foundation Flock.

As the sheep population of Queensland consists of 98 per cent. of the Merino breed, the Merino will be discussed first in respect of fat-lamb raising in this State. It is a mistake to think that any Merino ewe will do. Care should be taken in the selection of the largest framed, boldest, best constitutioned ewes obtainable. The sheep should be as free from wrinkles as possible. Ewes neither too young nor too old are best, for four and six tooth ewes still have all their strength and vitality, under ordinary conditions. With these ewes should be joined either the Border Leicester or the Romney Marsh rams. This advice may at first thought be regarded as reactionary, but it should be remembered that Merino ewes are the subject of present discussion.

Under ordinary conditions, the grower is advised to save the best of the ewe lambs from the resultant drop as the foundation of the fat-lamb producing flock proper. The object of this advice is to breed into a crossbred ewe flock as speedily as possible. Having established this crossbred flock and with fat-lamb production in view, the procedure with regard to the choice of rams naturally alters. On the long-woolled crossbred flock, growers are advised to use one of the Downs type of English ram. In Queensland, the greatest success has been gained with the South Down and the Dorset Horn. Healthy rivalry exists between exponents of these two breeds, but the advice to producers in the choice of either is to be governed by circumstances, such as locality, country, feed crops grown, the period selected as most suitable for lambing and other relevant circumstances. The South Down cross lamb is deservedly popular in the overseas trade. The Dorset Horn cross, too, has been very successful under Queensland conditions. Both breeds mature very early, a necessary qualification in this trade. Possibly, more success may be achieved with the use of the Dorset Horn in respect of lambing percentages. Of all the English breeds, the Dorset Horn alone will, like the Merino, mate at any period of the year. This is not to say that, even with the Dorset Horn, the extremely hot weather should not be avoided.

The difference in a crop of lambs got by pure-bred sires is most marked when compared with lambs sired by indifferent members of the breed. Only rams from registered studs should be used. It pays to use the best. The cost of better rams is always compensated by the enhanced price for the product.

The Corriedale.

The Corriedale, it is pleasing to relate, is fast improving in type in this State. When first introduced here, the tendency with breeders was to produce too fine a sheep. The breed was evolved as a dual purpose sheep by the joining of the Merino and the Lincoln, and the careful selection of sheep for mating within the breed. The pure-bred Corriedale ewe is one of the best of mothers for the production of fat lambs when joined with the Downs rams. She is docile and quiet and an excellent milker—making for early maturity in her lamb. Growers are advised to give more attention to this breed as part of the programme in the production of more and better lambs. This advice applies especially to holders of the rich brigalow and belah country, on the fringe of the Darling Downs, and other regions where that class of country is situated. It is on these areas of country that the greatest expansion in fat-lamb production is looked for. The preparation of

brigalow and belah country for cultivation is admittedly costly, but in view of the average price at which the land may be acquired it is thought that the necessary expenditure is well within the bounds of economy. In any case, the land has to be improved.

When breeding from a crossbred flock, bred as previously indicated from one of the longwools, it is recommended, with a view to maintaining the flock at a high standard, to join a few rams of the long-woolled type with the Downs breeds chosen with the idea of retaining the ewe lambs dropped as additions and replacements in the ewe flock. This is an important point, for suitable crossbred ewes are difficult to buy at a price satisfactory to the grower.

The Lamb Producing Flock.

The care and attention given the lamb producing flock calls for remark. Before lambing, it is not necessary or desirable to have the flock too fat. At joining time over-fatness is a distinct disadvantage, for ewes in this condition are shy breeders, and heavy lambing percentages should always be looked for in the industry. Too much condition applies especially as disadvantageous when crossbred ewes are grazed. The condition desired at joining and previous to lambing may be described as improving to strong store condition.

After lambing, no feed can be too good for the ewes and lambs. Ewes, then, before lambing may be grazed on any feed sufficiently good to maintain the condition described. This procedure saves, to no small extent, the cultivated crops prepared for the ewes and lambs. Once lambs are at foot the grower should do all he can to maintain the ewes at full flush. Apart from the increased weight aimed at, lambs properly finished travel much better, and present that bloom at the yards so appreciated by the buyer. Lambs should never be allowed to receive a check. If a paddock shows signs of depletion the flock should be immediately put on to fresh pastures.

Lamb Marking.

As distinct from the practice with the ordinary flock, lamb marking should be done when the lamb is younger. With comparatively small numbers, it is no hardship to treat the lambs in small lots. This, of course, is out of the question when the numbers are large, as in ordinary lamb marking where a muster has to be undertaken and other preparations made for the work. The best time at which to mark lambs intended for the fat-lamb trade is when they are a fortnight old. The loss of blood at this stage is very nearly negligible and recovery from the shock of the operation is rapid.

Old yards should not be used if there is any risk of infection in them. Instruments and knives should be carefully disinfected. Lambs should be returned to their mothers as soon as possible. Fat lambs, of course, should never be weaned. An axiom in the trade is straight from the teat to the block.

Marketing.

There are certain points in the marketing of lambs which, if attended to, would make for the improvement in returns to the grower, and saving in rejections. For the time being producers are urged, as previously stated, to hold their lambs in prime condition until they will dress to about 40 lb. A mistake is sometimes made in getting the whole

drop away together. This is obviously wrong. Even the duration of the lambing period points to this. Lambs should be marketed as they become fit and will go the desired weights. The extra trouble is admitted, but higher returns more than compensate for it.

It should always be remembered that fat lambs are very tender and bruise easily. They should never be prodded with sticks during trucking. A lamb should never be lifted in the race or elsewhere by the wool. Rough dogs should not be used. Lambs should not be overdriven, nor trucked when in a heated condition. Trucks should not be overloaded. All this advice applies to details, but if adopted the lambs will be delivered at the sale yard in the "bloom," a condition so much to be desired and so important in respect of the gaining of full market rates.

The need for more lambs, better lambs, and heavier lambs is so urgent and it is confidently believed that flock owners concerned will respond to the best of their ability and opportunity and the facilities available to them to the call for an increased production

SHEEP BRANDING AND FLEECE INJURY.

In Queensland, the use of tar and pitch as a sheep-branding material is prohibited. Both are injurious to wool, as neither scours out; and, further, both cause loss in the process of scouring. In the scour, clean wools should not follow wools which have contained tar or tar derivatives.

To be entirely successful, a branding mixture should fulfil two requirements—(1) the brand should be legible for the greater period of the fleece's growth at least; and, (2), the material used for branding should scour out without injury to the wool, or without affecting the scour liquor.

A mixture which has given reasonable satisfaction on both counts, is as follows:—

Wool fat	..	..	..	..	..	..	30	parts
Resin	..	..	..	..	..	..	29	"
Carnauba wax	..	..	..	..	..	..	3	"
Kieselguhr	..	..	..	..	..	..	18	"
Ignited iron oxide	..	..	..	..	..	..	6	"

Emco spirits to desired consistency.

Carnauba wax is vegetable, and is coloured yellow, cream, or white.

Kieselguhr is a diatomaceous earth.

Ignited iron oxide is red ochre of ferric oxide.

Emco spirit is the trade name of the material purchased as such.

—J. L. HODGE.

GADGETS AND WRINKLES

PULLING OUT TREES.

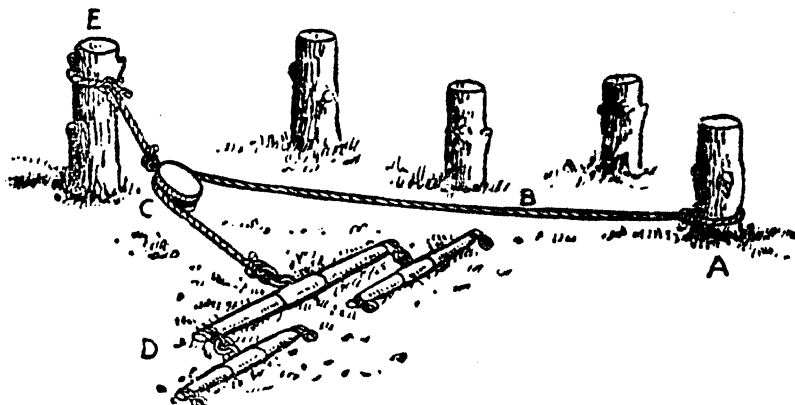


Plate 101.

Only stumps are shown in the illustration, but trees of limited sizes can be dealt with in a similar way. It may be advisable to use wire ropes, and the team of horses used should be steady pullers. Alternatively, a tractor may be used. A short rope or chain, with a single pulley (c) is attached to the tree to be removed (e). The anchor rope (b), which runs through the pulley, is fastened to the bottom of a stout tree or stump. Always pull towards the anchor tree.

LAND LEVELLING FOR EROSION CONTROL.

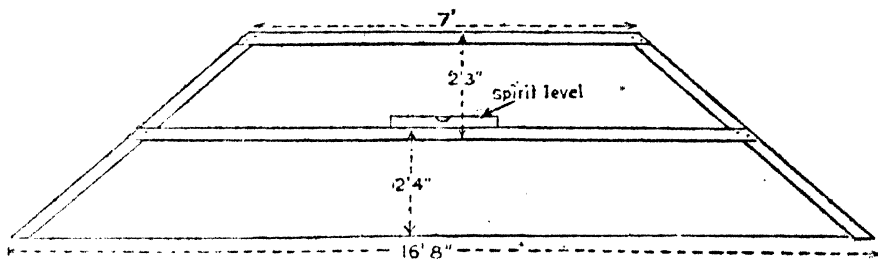


Plate 102.

A levelling device, such as depicted, is very convenient for laying out contours for soil erosion control. Two men are needed to operate it. One carries the frame with the centre of the upper arm on his shoulder. The other drives in pegs. When laying out a true contour the frame is used as shown, but if a fall is to be given to line, a movable foot is bolted or screwed on to one leg. In this way, one leg is made longer than the other by correct fall of distance between the two arms. Thus, if a fall of 1 in 100 is required, and the spread between the feet is 200 in., then the leg to which it is attached is 2 in. lower than the other. With the frame, two men can peg out 6 miles of contour banks in a day. The frame can be made of light straight oregon or red pine of 4 in. by 1½ in. Three pieces 8 ft. long and one of 12 ft. 6 in. are required. A carpenter's level is mounted on the cross-baton. In screwing the frame together, see that the distance between the base of the two legs is correct.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

EXAMPLE AND THE CHILDREN.

TWO ideas came uppermost recently when watching the behaviour of some high school children in a tram. The first was the old adage, "Example is better than precept," and the other was a concluding remark in a public lecture by a medical psychologist which I heard some years ago, "If you see a very nicely behaved child, you may be fairly sure he has very nice parents."

Good manners and courtesy are the oil on the gears of life. Mothers and fathers will realise how much they themselves appreciate courtesy from business people and others with whom they have dealings. Why, then, should they not make every effort to instil into their children the grace of good manners, and for the most part we must realise that good or bad manners are learnt in the home.

Is it to be supposed that there is no association between a small boy's cheeky answer to his mother when she asks him to do a job for her in the afternoon and his father's early morning display of rudeness to that same mother, because he was late for the office and the newspaper had not come? Children are great imitators, and after all they can only copy what they see. If their parents are rude or ungracious to their children and each other, how can it be expected that the children will develop good manners and courteous behaviour?

Parents should be impressed with the need for showing a good example in all sorts of ways, and manners in particular. There seems to be a feeling that good manners are rather "sissy," while in point of fact the lack of them is probably a sign of a certain juvenile quality in our national development and outlook, considering that the older and more developed civilisations consider the cultivating of good manners part of young people's general education. Even from the standpoint of economics, the well-mannered boy or girl has a much better chance of material advancement than the rude or uncouth type, because he impresses his employers more favourably.

So, in spite of the rush of every-day life these days, it is necessary to impress upon parents the need for giving serious consideration to the type of example they are setting the young children whose future behaviour patterns are now being formed in the home. If they try to practise just the little courtesy of accompanying requests to the children and each other by the "please" and "thank you" and "excuse me" which they are willing enough to grant to outsiders they will be placing a foundation for future character formation and mental development which ranks in importance with the food they give their children and the fresh air and sunshine their physical health demands.

Questions on this or any other matter concerning Maternal and Child Welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's Terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane*." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

In present circumstances, recommendations are subject, of course, to the availability of the ingredients mentioned or of suitable substitutes.

A Vegetable Broth.

Take 1 lb. gravy beef, $\frac{1}{2}$ lb. beef or veal bones, 1 small turnip, $2\frac{1}{2}$ pints cold water, 1 large onion, 1 carrot, 1 clove, salt, and pepper to taste.

Cut the beef into small pieces and place it with the broken bones in a saucepan. Add the water. Stand aside for one hour, then bring slowly to boiling point. Skim and simmer gently for two hours, and strain. Add peeled and chopped onion, carrot, turnip, clove, bay leaf, and seasoning to taste. Cover and simmer till vegetables are tender.

Gravy Soup.

Take $1\frac{1}{2}$ lb. shin of beef, 1 carrot, 1 medium onion, 1 stalk celery, 1 tablespoonful cornflour, $1\frac{1}{2}$ quarts of water, $\frac{1}{2}$ turnip, 1 oz. butter, pepper and salt to taste, 3 tablespoonfuls water.

Wipe the meat and cut into dice, then place in a saucepan. Pour over the water. Cover and bring to the boil and allow to simmer gently. Fry the sliced carrot, turnip, and celery in the butter (or dripping) till brown, then add to the soup. Put in the bay leaves. Simmer for three hours, then rub through a sieve. Dissolve the cornflour in three tablespoonfuls of water and stir into the soup. Boil four minutes, stirring constantly. Season to taste and serve.

Sausage and Egg Pie.

Bring 1 lb. pork sausages to boil and simmer very gently until they feel quite firm. Allow to cool, then remove skin and cut into dice. In the meantime boil 4 or 5 eggs until hard and cut them into slices. Melt 1 tablespoon butter in a saucepan, add 1 tablespoon flour, cook a little, then add 2 cups milk or white stock. Stir over gas until thickens, then add 1 dessertspoon grated onion. 1 tablespoon each tomato sauce and shredded and fried bacon, 1 cup diced potatoes, sausages, eggs, 1 teaspoon chopped parsley, salt and pepper to taste. Place in a pie-dish and cover with puff pastry and bake in a hot oven for ten minutes, then lower heat and bake for half an hour.

Vienna Steaks.

Mix together 1 lb. lean minced steak, 2 cups soaked bread, 2 teaspoons chopped parsley, 2 tablespoons grated onion, 1 tablespoon tomato sauce, 1 teaspoon Worcestershire sauce, pepper and salt to taste, and, if liked, a little savoury herbs. Bind with one beaten egg and form mixture into round cakes, flatten out a little, sprinkle with flour, and fry in a little butter or good dripping. When they have all been fried, place in a baking dish or casserole dish, cover with a little sauce made by cooking 1 finely-chopped onion in the fat in which the steak was cooked; add 1 dessertspoon flour, cook a little, then add 2 cups stock or water and salt and pepper to taste. Cook for about twenty-five minutes in a moderate oven.

Seaman's Pudding.

Take $\frac{1}{2}$ lb. chuck steak, 1 large onion, $\frac{1}{2}$ lb. flour, 2 oz. chopped suet, 1 teaspoonful baking powder, salt, pepper, a few outside stalks of celery.

Cut the steak into small pieces. Place them in a casserole (or pan) and cover with water. Add seasoning to taste, sliced onion, a little chopped parsley and chopped celery. Place the casserole in the oven and bring to the boil, skim well, and simmer for one hour (gently). Make some suet pastry with the flour, suet, baking powder, a little salt, and a little water. Roll out, and place in the casserole on top of the cooked meat. Put on the lid and simmer gently for about forty minutes.

Pineapple Pie.

Two cupfuls grated pineapple, 1 cupful water, 1 cupful sugar, 2 tablespoonfuls breadcrumbs. Line pie-dish with paste, mix pineapple, water, sugar, breadcrumbs, and yolks of 2 eggs, bake, and when cool beat up the white of eggs and put over pie.

Pineapple Turnovers.

Make a flaky pastry from 2 cups self-raising flour and half-cup dripping. Cut out shapes the size of a tea plate, put a spoonful of chopped pineapple and a little sugar on each fold, press over the edges of the pastry together, and bake in a brisk oven. The turnovers are better served with hot custard.

Volume 58

Part

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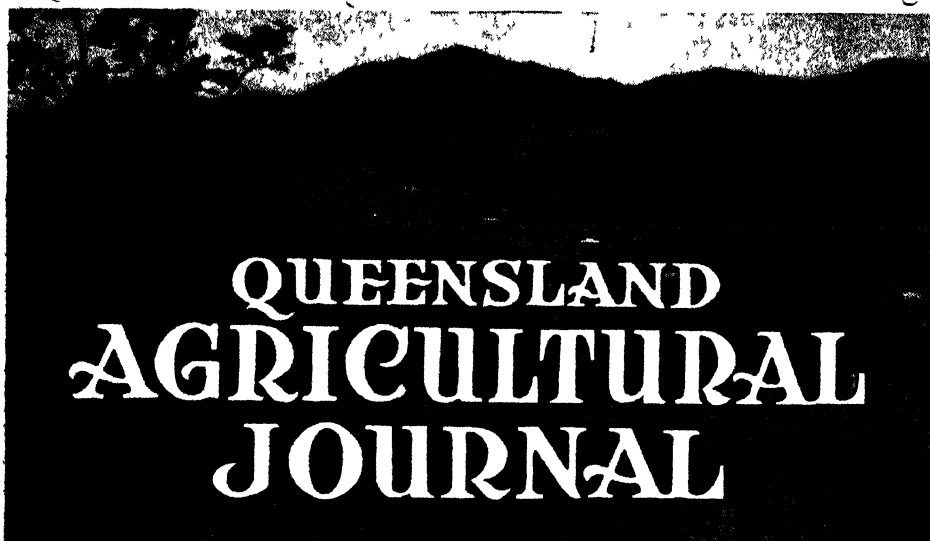


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ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



QUEENSLAND AGRICULTURAL JOURNAL

Volume 58

1 APRIL, 1944

Part 4

Event and Comment.

A National Farming Policy.

FOLLOWING is a brief summary of the first report of the Rural Reconstruction Commission, in which the problems associated with the formulation of a national farming policy are reviewed in a general way —

The Commission believes that the provision of electricity would do more to bridge the gap between city and country life than any other single factor. Although there are difficulties, it believes that it should be a national objective to give every farm which is not too remote the opportunity to use electricity at a cost comparable with that in the cities. It considers that the minimum household equipment should include, in addition to well-ventilated rooms of reasonable size, a reliable water supply; a kitchen sink with water laid on; adequate cooking facilities; a bathroom and a wash-house; and satisfactory arrangements for food storage. The report also suggests consideration of mass production of refrigerating equipment by the Commonwealth.

The Commission agrees that the principle of wage fixation is an essential step in the agricultural development of Australia.

Better Education.

THE Commission states that criticism of the present system of education may be grouped under three headings, viz. :—

1. Inadequate opportunities for many country children to obtain education at more than a low standard.
2. Education is insufficiently related to the realities of farm life.
3. Inadequate education in technical farming matters.

These criticisms demand a reorganization of the school system in country districts, and adult education also needs careful consideration.

The Commission considers that organization and equipment of health services in some regions should be improved. A co-ordinated scheme of base hospitals and district hospitals, with adequate equipment and staffs and including maternity and bush-nursing institutions, is necessary.

It recommends that more attention should be given to the scientific survey of the soils of areas regarded as desirable for land settlement. Settlement of any area should not be planned until the suitability of the soil for the intended type of farming has been determined.

Water Schemes.

THE Commission expresses the opinion that very careful consideration should be given to any proposal for the diversion of water which might ultimately be required for agriculture. If it is accepted that the cost of providing large head-works should be a Commonwealth or State matter, the nation should reserve the right to decide in large measure the use to which the water is to be put.

It should be a long-range objective to foster a gradual increase in the size of farms where necessary, until they are large enough to warrant mechanization to facilitate relatively low-cost production and fair returns

Land Values.

DEALING with land values, the report states that people should not be called on to pay high prices for foodstuffs because land is held for speculative reasons. The terms of leases and share-farming agreements require investigation, as in many cases they lead to low-grade farming and exploitation.

There is need for greater foresight into the financial stability of farming in the future, the report adds. There seems little to be said for asking the taxpayer to provide money to liquidate debts incurred by unwise borrowing without, at the same time, taking action to reduce the chances of a recurrence of such a crisis. The provision of credit for schemes of rural development requires careful consideration.

War Agricultural Committees in Britain.

SOME interesting facts on wartime farming in Britain were given recently to a gathering of primary producers' representatives and other citizens in Brisbane recently by a visiting authority on present-day British agricultural economy. At the outbreak of war, he said, England had 11,000,000 acres under the plough and just twice as much under grass. Britain is now probably the most highly mechanized country in the world, with 18,000,000 acres under the plough and 15,000,000 acres under grass. Realising that Britain would have to depend largely on her own agriculture for essential foodstuffs, a war agricultural committee of leading district farmers was appointed in every county under the guidance of the Ministry of Agriculture. Every farm in the land was subsequently graded as A, B or C, the "A" farms being those which were well managed, and the "C" grade those on which standards of production had, willy-nilly, to be raised. As the organization developed and after rural wage adjustments and increases had been determined, it was decided by the Government that no one was to leave the industry without permission. In addition, the Women's Land Army—now with a membership of 80,000—was organized for a nation-wide food production service. School holidays were arranged to coincide with harvesting, so that every available boy and girl might assist; local business people were also co-opted for urgent farm work when needed. As a result of intense organization and a realistic handling of production problems, the harvests of the last three years have broken all pre-war records.

Field Crops

Fodder Conservation.

C. J. McKEON.

FODDER conservation in the form of silage has been practised in Queensland for many years, but the annual aggregate storage has been far below ordinary winter requirements, apart altogether from drought reserves which should be stored in seasons of abundance. Soil and climatic conditions throughout the agricultural districts of Queensland are generally favourable for the production of many summer fodder crops, which provide a great bulk of material suitable for silage making. Hence, if full advantage were taken of the bounty of nature stock losses during seasons of scarcity would be greatly reduced. In addition to its drought insurance value, however, silage provides a succulent and nutritious winter stock food at a time when natural pastures are usually dry, unpalatable, and lacking in nutritive value. It has been proved that the feeding value of silage is little, if at all, inferior to that of the green material from which it was made, and this, coupled with the fact that its succulence and laxative properties promote a better functioning of the digestive system than dry feed, makes it a very valuable fodder.

Winter rainfall is usually unreliable in most districts in this State consequently the planting of seasonal crops for grazing purposes cannot be undertaken with any certainty that they will provide sufficient food to enable stock to winter well. Summer fodder crops, however, can be sown with far greater confidence, and from them a much greater bulk of green material can be produced.

During the early years of the development of dairy farming in Queensland, especially on the fertile soils of the rain-forest districts, the growth of sown pastures was so luxuriant that the need for fodder conservation was not felt. The rate of stocking was then considerably higher than that of later years. The gradual decline in the carrying capacity of even the richest lands through the lowering of soil fertility, through soil impaction caused by heavy stocking, and through the old swards becoming root-bound has since made fodder conservation a necessity in the majority of holdings in every dairying district.

The same serious reduction in carrying capacity has also occurred in native pastures largely as a result of over-stocking. The stock naturally show a preference for the more nutritious and more palatable native grasses, with the result that they have been kept in a closely-grazed condition and been prevented from seeding. The inferior species

have been neglected to a large extent, and, consequently, have seeded freely and ultimately predominated in some cases.

For the reasons just given, a silo is really a necessity on most properties in agricultural areas. It is a very definite asset, and it is doubtful if the outlay involved could be expended on any other improvement with greater financial benefit. The increased butter production alone resulting when dairy cows are fed on silage during the winter months of normal seasons would soon compensate for the expenditure involved. In addition, a well-filled silo would be the means of saving at least a portion of a herd during drought periods, when the cost of fodder precludes its purchase by many stockowners.

Admittedly many are not in a financial position to build the more costly types of silo, but if it were more widely appreciated how effectively and cheaply silage can be conserved in the less costly silos it would be used to a much greater extent than it is at present.

The making of silage is not a complicated process calling for considerable skill and experience. The reverse is the case, less skill and experience being required than for the making of good hay. Furthermore, the best quality silage can be made during weather conditions which would make the curing of hay impossible. Once a crop has reached the correct stage for converting into silage a start can be made regardless of the weather and, providing a few simple rules are observed, silage of good quality can be made by anyone who has had no previous experience.

The Making of Silage.

Good quality silage can be made only from material which has been cut and stored in a fresh, green state, the aim being to conserve the fodder in a succulent condition. This is brought about by acid fermentation which occurs when the air is excluded from the mass; consequently, the quality of the silage will be very largely influenced by the extent to which the air has been expelled and excluded from the material. It is therefore necessary that the silo be as airtight as possible.

The best quality silage is that known as "acid" silage, which is light-brown to yellow-brown in colour and possesses a distinctly pleasant acid smell—hence the name. Silage of this kind can be made only from suitable types of crops, and then only when these have been cut at the right stage of growth and handled in the correct manner. If crops have been allowed to reach an advanced stage of maturity, or if they have been allowed to dry out in the field after being cut, normal fermentation will not occur, moulds will develop, and an inferior silage, known as "mouldy" or "musty" silage, will be the result. Crops which would otherwise be suitable, but which have been cut when very immature, or which are naturally of a very soft succulent nature, also make an inferior silage when used alone, for the soft, sappy material packs so closely that little heating takes place. Silage made under these conditions possesses an objectionable smell and is known as "sour" silage. Immature material or material of too succulent a nature may be used, however, to advantage by blending with material of a coarse and more fibrous nature, such as maize or sorghum. The proportions in which it should be blended, with either of the latter crops, depend upon its degree of immaturity or succulence, but, as a general rule, it should not be mixed in more than equal proportions.

The material should be cut when in a green, but not immature, stage, and should be carted from the field and placed in a silo as soon as possible after being cut. On no account should it be allowed to lie in the hot sun and become badly wilted. Should this occur for some unavoidable reason, it is advisable to sprinkle the material with water as it is being conveyed to the silo from the cutter. If, however, the quantity of material so affected is large, it should be mixed in equal proportions with freshly-cut material when being stored, and, if necessary, also sprinkled with water.

Silage which has been properly made will keep for many years without deteriorating in any way if stored under airtight conditions. It is not damaged in any way by insects or vermin, nor is there any risk of loss by fire as is the case with hay.

The Feeding of Silage.

If required, silage may be fed from eight to ten weeks after being made. Stock quickly acquire a taste for it and greatly relish silage, and rarely is any trouble experienced in getting them accustomed to it. When it is intended to feed it to dairy cows that have not previously had silage, it is a good practice to place a small quantity in feed boxes at the head of each bail for a few days before commencing regular feeding. When this is done, the cows almost invariably acquire a taste for it within a few days.

Silage is not only a nutritious and palatable food for dairy cows but it is also excellent for sheep, and during winter months or dry periods, it is of particular value for breeding ewes. It is not generally regarded as being suitable for horses; they will eat it, but it should be fed sparingly to them.

It is advisable to commence feeding a small ration, gradually increasing the quantity until the full ration is being fed. This particularly applies to stock which have been on dry feed and which are likely to be affected by scouring if a full ration were fed from the commencement. The amount of silage to be fed daily is governed by the weight of the animal and the quantity and quality of milk produced, in the case of dairy cattle, as well as by the amount of natural feed available.

Silage made from crops such as maize and sorghum, which are those most widely used for this purpose, contains a high proportion of carbohydrates, but it does not contain sufficient protein to constitute a balanced ration. Therefore, when fed to dairy cows with a view to maintaining or increasing milk production, silage should be supplemented by protein rich food, such as lucerne, cowpea, field pea, seed cake preparations, and meat meals.

Suitable Silage Crops.

The best silage is made from crops with a high sugar concentration, as these form sufficient acid to ensure the desired state of preservation. Legumes are unsuitable for silage-making alone unless strong preserving acid or fermenting molasses is added. As a general rule, these crops are better conserved as hay. The chief crops produced in Queensland for silage purposes possess the desired sugar content and, in addition, produce a large quantity of green material.

Maize is the most popular and also the most suitable of all crops for silage purposes. To facilitate harvesting and also to promote good

cob growth, it should be sown in rows just sufficiently wide to permit of inter-row cultivation. It may also be spaced closer in the rows than when the crop is grown for grain. The crop should be cut when the grain is well formed but before it has commenced to harden. The ideal stage is when the grain reaches the late dough stage. The cheapest and most efficient method of harvesting maize for silage-making is with a maize binder, but few of these very efficient labour-saving machines are now to be seen and the crop is usually harvested by hand, using a cane knife or other suitable tool.

Improved Yellow Dent, also known as Fitzroy, Golden Beauty, and Star Leaming are varieties which can be recommended as silage crops. The first mentioned is suitable only for coastal districts where the rainfall is generous and reliable, whereas the other two varieties can be grown both on the coast and inland. On good soils and under favourable seasonal conditions, yields of from 12 to 15 tons of green material to the acre may be expected.

Sorghums (Plate 103) are next in favour for silage-making and are particularly suitable for districts in which the rainfall is light or unreliable. They can also be grown successfully on poorer types of soil, which are not suitable for maize. The saccharine types are recommended in preference to the grain types, as the stalks of the latter are of a pithy nature and have a low sugar content.

The commonest practice is to sow these silage sorghums broadcast, but many arguments can be advanced in favour of sowing them in rows, spaced either just wide enough apart to permit of inter-row cultivation or sufficiently close to enable the plants to suppress weed growth. When the closer spacing is adopted, a seed drill should be used for sowing the seed, and a very satisfactory row spacing can be attained by blocking every second grain run, thus spacing the drills 14 inches apart.



Plate 103.

SACCHARINE SORGHUM CROP SUITABLE FOR SILAGE.

Crops sown in rows are handled with greater ease and celerity and are less likely to lodge and become a tangled mass than when sown broadcast. This is particularly important when the full length stalks are to be used, as in trench silos and stack silage, because bent and twisted stalks cannot be stored so compactly as straight stalked material. The crop should be cut when the grain is in the same condition as that recommended for maize silage. The same methods of cutting the crop are also usually adopted.

The most widely-grown varieties are Imphee or Planter's Friend, Saccaline, and Honey. Other varieties are White African, Sugardrip, Orange, Italian, Colman, and Sumac. Under favourable conditions, yields of up to 20 tons to the acre may be expected, and this figure may be exceeded under very favourable conditions.

Sudan grass also makes excellent silage and is a crop which is particularly suitable for inland districts. It may be used alone or in conjunction with the coarser stalked crops, such as maize. When made into silage with full length maize stalks in either trenches or stacks, the fine stalks of the Sudan grass pack closely between the coarser maize stalks, thereby assisting in expelling the air as the mass of material settles.

If available, a seed drill should be used for sowing Sudan grass, but, if not, the seed should be sown broadcast. The best method of cutting the crop is with an ordinary reaper and binder, as material so cut is more easily handled, both in the field and when being placed in the silo, than crops which are cut with a horse mower. The correct stage for cutting is when the grain is just forming. Given favourable weather conditions, two or more cuttings of Sudan grass may be expected. From a well-grown crop a first cut of 8 to 10 tons of green material to the acre may be produced. Any subsequent cutting is usually much lighter.

White panicum and Japanese millet, which are fairly extensively grown for hay and grazing, are also of considerable value for silage-making, being converted into silage either alone or as a mixture with maize or sorghum. They can be grown successfully on a fairly large range of soils but are not so well suited to such districts as the Darling Downs and the Maranoa as is Sudan grass. For coastal districts the reverse is the case. They are sown and cut in the same way as Sudan grass, but the yields of green fodder are somewhat lighter. Cutting should be carried out before the grain has developed. They are free seeders and shed their seed readily and should, therefore, not be allowed to produce mature seed; otherwise a considerable amount of trouble will be experienced in dealing with the volunteer growth which will appear the following season.

The foregoing crops are the most widely grown and also the most suitable for silage purposes, but, in addition, other summer-growing crops, such as cow cane and elephant grass, produce a great bulk of fodder and may be successfully used if cut before the stalks become too woody, particularly if a light-stalked crop is mixed with them. Pasture grasses, such as paspalum and Rhodes grass and others of a similar habit of growth, may also be cut for silage, but when these are being used alone, i.e., not as a mixture with heavier-stalked crops, they should be cut when in a fairly mature, but not dry, stage, and on no account should they be used for silage in a young stage. If this were done, the best

that could be expected would be sour silage, and very often the resultant material would turn out an almost worthless sodden mass.

Legumes such as lucerne, Poona, Black, and Groit cowpeas are rarely used alone in Queensland for silage-making, but are frequently mixed with non-leguminous crops, thereby increasing the feeding value of the silage. Lucerne is easily cut and handled and presents no difficulties in this respect, but owing to their habit of growth, cowpeas are much more difficult to cut and handle, and, consequently, they are not used to the extent they might otherwise be. Some success has been met with when cowpeas and maize or sorghum have been grown together, but such a combined crop is usually difficult to handle, and furthermore, a heavier yield is generally obtained when the two crops are grown separately. Nevertheless, a combination of Groit cowpea and maize has proved promising on the Atherton Tableland. A light sowing of the cowpeas can be made, the seed being sown in the same drills and at the same time as the maize. No general recommendation can be made regarding cowpea varieties for silage, as soil fertility and seasonal conditions have such a marked influence on the growth and period of maturity. The aim should be to select a variety of cowpea that will produce the desired amount of foliage and reach the correct stage for cutting at the same time as the maize. It should not, however, be a variety which will produce a crop of vines sufficiently heavy to restrict the growth of the maize or weigh the plants down and thus add to the cutting and handling costs.

Winter-growing crops which may be used for silage-making are wheat, barley, oats, and field pea. Florence wheat and Dun field pea, when sown together at the rate of 40 lb. of the former and 20 lb. of the latter to the acre, provide an excellent mixture, as both crops reach the correct stage for cutting, i.e., the flowering stage, at the same time. Other winter cereals, when sown in conjunction with field pea, also give very good results. The growing of winter crops cannot be undertaken with the same degree of certainty as in the case of summer crops, nor are their yields of green material comparable with those from summer crops, such as maize or sorghum. Hence the growing of these or other suitable summer crops, in preference to winter crops, is recommended.

Tower Silo.

The reinforced concrete tower silo (Plate 104) is usually the most costly type to construct, and, in addition, a more expensive plant is required to fill it than is necessary for an underground silo. The points in favour of the tower silo, however, outweigh those objections, and for anyone who is in a financial position to build one, this type of silo is strongly recommended. If properly constructed it is practically everlasting.

The best results are obtained when the silo has been so constructed that the height is considerably greater than the diameter, thereby ensuring sufficient pressure to consolidate the materials properly. The usual practice is to make the height of the silo approximately double the diameter of the silo, e.g., a silo 14 feet in diameter should be 28 feet in height. Should it be desired to reduce the height of the silo above ground, this can be done by excavating and building a portion underground. The cost of construction varies very considerably, and is influenced largely by the distance that materials, particularly sand and metal or river gravel, have to be carted and the amount of outside labour required.

In addition to an engine and cutter, which is required for chaffing the material to be converted into silage, either a blower or an elevator is necessary to convey the chaffed material to the silo. The latter calls for additional power, and an engine of at least 5 horse-power is required to drive the cutter and at the same time provide the necessary power to work the blower or elevator.

Filling the Tower Silo.

During the whole time filling operations are in progress one person should be stationed inside the silo to keep the chaffed material evenly distributed and well trampled, paying particular attention to the material adjacent to the wall. As the chaffed material is falling from the top of the silo, the heavier particles drop in the centre, and the light, leafy portions drift towards the wall. It is therefore essential that constant attention be paid to the even distribution of the material. On no account should this be done at lengthy intervals, as it will not then be possible to get

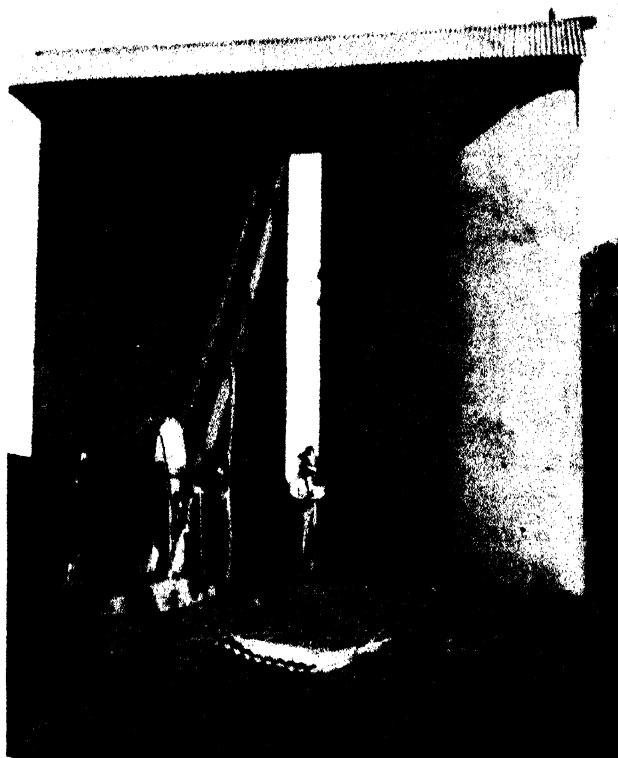


Plate 104.
REINFORCED CONCRETE TWIN TOWER SILO.

an even mixing, with the result that an uneven consolidation will occur and the quality of the silage will be adversely affected.

As a greater settling occurs in the centre of the silo than elsewhere, it is advisable to keep the material slightly higher in the centre. When filling has ceased for the day, all who are assisting with the work should enter the silo and thoroughly trample the material. Filling should be continued each day until the silo has been filled. Should operations be unavoidably held up, the top layers of material will quickly deteriorate if left exposed to the air, and should it be evident that any more than a few days will elapse before it will be possible to resume filling operations, it is advisable to cover the material with a layer, several inches in depth, of finely-chopped succulent grass or something equally suitable. The covering layer should be removed immediately prior to filling being resumed, care being taken to see that no material showing signs of mould is left. The same care is necessary where a protective covering has not been used, as it will then be necessary to remove the top layers of the

material which is being converted into silage and which have become dry or are showing signs of mould.

When the silo has been filled, a layer of approximately 12 inches in depth of some fine-stalked, succulent material should then be added and spread evenly over the surface as soon as possible. When well trampled, this forms a dense, mouldy mass and prevents the entry of air. When suitable green material is not available, wet chaff may be used.

Weighting material is of great assistance in bringing about the desired consolidation of the top few feet of material, but it is not an easy matter to convey the required amount of earth or stones to the top of the silo and, rather than do so, many prefer to devote more time to the trampling of the top few feet of silage and also of the material which is used as a protective covering.



Plate 105.

CIRCULAR PIT SILO SHOWING CONCRETE COLLAR AND SLIDING ROOF.

Emptying the Tower Silo.

When it is intended to commence feeding the silage to stock, the covering material and with it the top layer of silage which has been in contact with the mass of mouldy covering material should be removed. If the material has been thoroughly trampled, the quantity of silage which has become mouldy will be negligible, and usually the removal of a layer an inch or two in depth is all that is necessary. Silage deteriorates when exposed to the air for any length of time, and each day's requirements should be taken from the whole of the surface to a depth of at least 2 inches. This prevents any remaining exposed for more than twenty-four hours. An ordinary garden rake is very suitable for removing the silage, as the surface can be maintained in an even condition and the layer below is not disturbed, as would be the case were a fork or other long-pronged tool used.

So little time is required each day in removing and replacing a cover that the use of one is recommended. This can be made from

canvas or any other suitable material, and will assist very materially in keeping the silage in a succulent condition.

Circular Pit Silo.

The circular pit silo (Plate 105) is becoming increasingly popular, and during recent years a very large number have been constructed. Providing a suitable site is available, it is not necessary to concrete the whole of the silo, and in such a case all that is required is a concrete collar 4 inches in width and 5 feet 6 inches in depth. The usual practice is to have portion of the collar projecting above ground level, and thus all risk of storm water finding its way into the silo is eliminated, and considerable protection is afforded against accident to human beings and straying stock. The collar type of circular pit silo would be unsatisfactory in many locations and, in such cases, it will be necessary for the whole of the pit to be concrete lined.

It is essential that the wall of the collar type of circular pit silo be kept plumb, and also that, below the collar, it be smoothly trimmed to ensure even settling of the material. Cavities in the wall will be the means of causing the silage adjacent to them to become mouldy or of inferior quality. By using an iron rod and batten, no difficulty should be experienced in keeping the wall plumb.

Providing the silo has been properly constructed on a site where there is no danger from water seepage, silage of the best quality can be made in the collar type of circular pit silo and kept for many years in splendid condition. The concrete collar type of circular pit silo can be more cheaply constructed than either the tower type or the completely concrete-lined circular pit silo, and the additional saving of the cost of a blower or elevator is effected, as compared with the tower type. The completely concrete-lined circular pit silo costs about the same as the tower silo, but here again the cost of a blower or elevator has not to be incurred. The removal of the silage from either type of circular pit silo, however, requires a little more time and labour than is the case with a tower silo, but for those who do not feel disposed to construct the latter type, the pit can be recommended as an efficient substitute.

Filling the Pit Silo.

The same methods should be adopted in every detail in filling a circular pit silo as when filling a tower silo. Weighting material to provide additional pressure may be applied with less inconvenience to the pit than to the tower silo. Furthermore, as the pit silo is covered either by a high shed or a low sliding roof, it is possible to thoroughly trample the material at a higher level in the silo than is the case with the tower silo, which of necessity has a fixed roof with little clearance between the top of the silo and the lowest portion of the roof.

Emptying the Pit Silo.

A hoist is necessary for the removal of the silage. The type of hoist, together with the self-emptying drum, which is recommended for use when excavating the pit has also proved highly satisfactory for the removal of the silage, and can be very cheaply constructed. The silage should be collected for removal in the same way as in the tower silo, and the same precautions should be adopted to keep the silage in a fresh, succulent condition.

Trench Silo.



Plate 106.
EXCAVATING A TRENCH SILO.

The trench silo (Plate 106) is a cheap and very efficient type, and is particularly suitable for inland districts where prolonged rainy periods are not generally experienced, and consequently the risk of seepage water gaining access to the trench is slight. Care is necessary in selecting a site, and one in which seepage is likely to occur should be avoided. The only cost involved in constructing a trench silo is for labour, and when the usual practice of excavating by means of a plough and scoop is adopted, the cost is small. Under normal conditions, and with a suitable plant, two men

can excavate a trench of at least 50 tons capacity in two or three days. The excavation is usually 10 feet wide, approximately 8 feet deep, and whatever length is necessary to accommodate the material to be made into silage. The ends are sloped sufficiently to permit of the trucks or wagons being driven through the trench when unloading. The sides should be trimmed as evenly and as smoothly as possible. If logs are available, these should be laid along each side of the trench and the excavated earth banked over them to a height of approximately 2 feet. A gradual taper away from the trench should be allowed to prevent storm water gaining entry to the silage.

Filling the Trench Silo.

The material in a trench silo is usually made into silage in a whole or unchaffed state, and, in doing so, care should be taken to lay the stalks in one direction only. This applies particularly to thick, long-stalked crops, such as maize or sorghum, as the best results cannot be obtained with them when too much air is admitted as a result of careless spreading or laying the material in transverse layers. It should be spread in even layers, lengthwise along the trench.

The truck or wagon may be driven through the trench as each load is being spread. This allows the material to be handled more easily and more expeditiously than if it were unloaded from the side of the trench, and it also consolidates the silage. Filling (Plate 107) should

be continued until the material is well above the top of the trench to allow for subsidence. Should the material be likely to subside to such an

extent that more is required, this may be added a week or ten days later. In the interval, a covering of green grass should be provided to prevent the formation of mould on the top layer. When the trench has been filled, a thick layer of green grass should be spread over the top of the silage material, and this in turn should be covered by earth excavated from the trench. The earth covering should be formed in such a manner that when the silage material has completely subsided there will be sufficient camber to turn rain water away from the trench.



Plate 107.
PARTLY FILLED TRENCH SILO SHOWING TRACTOR
CONSOLIDATING THE MATERIAL.

Emptying the Trench Silo.

The silage should be removed from one end of the trench, and only that section of the covering material which will allow the required amount of silage to be removed should be disturbed. A sharp hay knife or broad axe is very suitable for the cutting of the silage. It should be removed in vertical sections, thus exposing the minimum amount of silage to the air.

Stack Silage.

Silage may be easily and cheaply conserved in stacks, but this method is only recommended when the silage is to be used within a few months after being made. Even when most carefully built, exposure to the atmosphere causes wastage on the sides and ends of the stack, and this increases with time. The stack should be erected in a well-drained situation, and in a position handy for feeding. A further point to be considered in selecting the site is the proximity of the stack to the field in which the crop to be used is growing. A rectangular-shaped stack is to be preferred to a square stack, one of the main advantages being the reduction in the surface of silage exposed when the end of the stack is opened for feeding.

Framework.

The framework consists of bush timber from 4 inches to 6 inches in diameter at the butt end, erected in the manner shown in Plate 108. The poles are sunk in the ground to a depth of approximately 20 inches, and

should be at least 15 feet above ground. The top plates and the brace at each permanent end of the stack should be fastened to the uprights with a wire twitch. Where a stack of large dimensions is being built, or where a light framework is used, it is advisable to provide one or more cross braces for the framework. When only one cross brace is used, it should be fastened to the central upright on either side, and provision made for the central uprights to be at least 3 feet higher than the others. It is then possible to have the central brace much higher than the top of the framework, and thus offering less obstruction when stacking the material as the stack is nearing completion. Any other cross braces used should be handled in the same manner as the central brace. In addition to the uprights required for the framework, a pair should be erected at each end of the stack to bear the cross piece which is used to support the ends of the fodder until they are trimmed off level with the permanent end of the stack. The uprights along the side should be spaced 3 feet apart when long-stalked crops are being stacked. The distance is reduced to 2 feet 6 inches or, if necessary, to 2 feet for shorter-stalked crops like white panicum or Sudan grass. Where possible, the framework should be erected close to a tree, which can be used to support the whip for lifting the material when the height of the stack calls for its use.

Stacking.

Before commencing the stack, a layer of green grass, at least 6 inches in depth, should be spread evenly over the ground to prevent the silage from coming in contact with the earth.

When stacking maize or sorghum, the farmer should begin by laying the material in such a way that the heads of the plants extend 3 feet to 3 feet 6 inches beyond the permanent end of the stack, the distance being reduced to suit shorter-stalked crops. He should continue to lay the material evenly, with the heads facing the one way, until the butts of the plants extend a similar distance beyond the opposite permanent end. The material should not be laid end to end, but should be laid in such a manner that it overlaps for about one-third of its length. After placing a layer along the entire length of the stack, the next layer should be commenced by laying the material in the reverse manner—i.e., the butts should be facing the direction in which the heads are facing in the previous layer. The work should be continued in this manner to the opposite end of the stack. By reversing the layers in the manner described it is possible to maintain an even surface, particularly when heavy-stalked crops are being stacked. When the material has been stacked to a height of 2 feet 6 inches, the projecting ends of the material being stacked should be trimmed off flush with the uprights which are to form the true end of the stack. A sharp cane knife will be found very suitable for trimming the ends. Before stacking is resumed, the cross piece which is used to support the projecting ends of the material should be raised level with the top of the stacked material and fastened to the additional uprights which have been provided for that purpose. Each time a similar quantity of material has been added to the stack the projecting ends are trimmed as previously described, and the cross piece again raised level with the top of the stack. The trimmings should be laid along the centre of the stack. During the whole time stacking is in progress, the material should be well trampled along the sides.

When the material is carted by dray or lorry, it is not necessary to use a whip or hoist until the stack is nearing completion, as the



Plate 108.
SILAGE STACK IN COURSE OF BUILDING.

material may be handed from the vehicle to the person on the stack. In this case it is very necessary that the material be received from both sides of the stack, for if received from one side only, the extra trampling will cause a much more rapid settling on that side. As a consequence, the material on the opposite side of the stack will not consolidate sufficiently to permit of the production of good silage.

After stacking has been finished at the end of each day, it is a good plan to add weight to the stack. An easy and effective way of doing so is by passing lengths of fencing wire over the stack and suspending a long pole from these on either side of the stack. These poles should be suspended well clear of the ground, as a considerable amount of settling takes place during the night. Very little additional time is required in applying the weight each evening and releasing it the following morning.

When the whole of the material has been placed in the stack, a layer of green grass at least 6 inches in depth should be spread over the top of the stack. Earth, stones, or other weighting material should then be placed on this, forming a camber along the length of the stack. When earth is used, it is advisable to lay light logs along each side and end on the top of the stack to form a bed to keep the earth in position. To provide the required pressure, a layer of earth at least 1 foot in depth is necessary. After placing the weighting material in position, a covering of dry grass should be placed on top of this, and as it is very necessary that water should not gain access to the silage, the earth and grass should be placed in such a way that rain water is turned over either side of the stack. This means that, when completed, the stack will be appreciably higher along the centre than at the sides.

Opening the Stack.

The silage should be removed from one end of the stack only, using a hay knife or broad axe to cut a shelf from top to bottom. Only sufficient of the covering should be removed to permit of each day's requirements being taken out, and as small a surface as possible should be exposed to the air. A certain amount of wastage will inevitably occur on the ends and sides, but, providing the material has been carefully stacked at the right stage of growth, and the silage has not been kept for more than four or five months, the wastage should not be great.

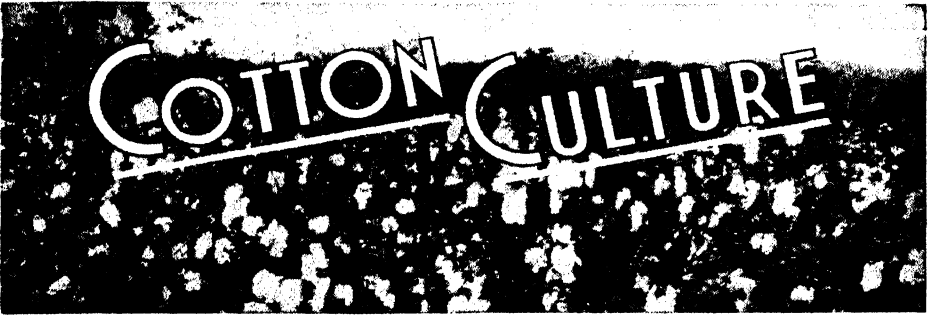
THE COUNTRYMAN'S SESSION

Sunday Morning Radio Service to Farmers

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Community One-variety Cotton-growing.

A. NAGLE, Senior Instructor in Cotton Culture.

THE benefits obtained by a community through growing only one variety of cotton are resulting in the rapid increase in the adoption of this form of cotton production in many cotton-growing countries. In the United States of America, for instance, since 1932 over a thousand organizations have been formed to grow cotton on this basis. In some cases there, the organization may consist of only a small group of farmers formed to grow a variety, but in most instances it is on a much larger basis, such as a county or a group of counties with a membership of hundreds of growers producing thousands of acres of the one variety.

In the United States of America this form of community enterprise provides a means whereby the farmer can produce cotton of high quality, which is ginned efficiently and sold at its full value. It has also been demonstrated that when a group of farmers grows only the one variety known to be suitable for the district, the farmer is more inclined to study his methods of production when low yields are obtained rather than blame the variety and change over to another one. Undoubtedly community one-variety cotton-growing should be adopted wherever soil and climatic conditions are suitable for this method of cotton production.

The available information in Queensland on the suitability of the main soil types for cotton and the best variety or strain to grow on each, allows of a summing up of the possibilities of community one-variety cotton-growing being established in this State.

In the earlier years of the present cotton-growing industry in Queensland there were available for general distribution only a few varieties of cotton, which had been introduced on account of their performances in their country of origin making them appear to have possibilities here. Owing to the rapid expansion of the industry these relatively uniform varieties had to be released to meet the demand for planting seed before their suitability for the various conditions had been fully investigated. Consequently, the one variety was allotted in some instances to all growers in a small isolated district. When such a district embraced a wide range of soil types as, for example, in a valley where cotton was grown both on the slopes originally under brigalow and softwood scrub and on the alluvials originally under eucalypt forests, the yields of cotton obtained frequently gave clear-cut evidence that a variety suitable for the slopes need not necessarily produce good crops on the more fertile alluvials.

Such variations in yields led to the carrying out of a long series of investigations, the results of which indicate that in most cotton-growing

districts of the State at least two varieties will be required—one for the more fertile loams and sandy loam soils, and one for the clay loams and heavy clay soils. Unfortunately, the same two varieties cannot be used in all districts, but it has been possible, however, to select five out of a large number tested, which will meet the needs of the main commercial areas. A description of these varieties with detailed recommendations for their use will appear in later numbers of this Journal.

The Queensland system of a growers' commodity board controlling the whole of the cotton crop and ginning it in large centrally-located ginneries, where upwards of 10,000 bales of raw cotton or 30,000 wool packs of seed-cotton may be ginned annually in the one ginnery, is conducive to obtaining low-operating costs and efficient grading, ginning, and marketing. Under this system the commodity board takes possession of each grower's cotton as soon as it is placed on rail at his nearest railway station, and pools all freight, grading, ginning, and marketing charges incurred for the whole crop. When a grower's cotton arrives at the ginnery in either woolpacks or bags, each container is weighed, graded, and stapled separately by a Government grader, and the grower is paid a first advance of approximately 80 per cent. of the estimated value of his cotton—based on the selling agreement made by the Commodity Board with the Australian spinners. This payment provides for the price differential due to the grower on account of the grade and staple of the fibre and the lint percentage of his cotton. Subsequent payments, as the monies accumulate from the sale of the crop, are made on a flat rate per lb. basis, according to the amount of raw cotton he forwarded. It is not necessary, therefore, to maintain his identity with his cotton after it has been weighed, graded, and stapled. Each container of any consignment is therefore distributed in the large cotton receipt house according to its grade, staple, and variety. This procedure allows of the accumulation of a considerable amount of cotton of the one grade, staple, and variety to be ginned in the one "run," thereby eliminating the possibility of serious "plating" of the bales of raw cotton occurring through consignments of cotton of markedly different grade following each other in the ginning operations. This latter feature is further guarded against by running out the breast rolls in the ginnery before changing over to another grade, and also by following on with the nearest similar grade and staple length of the same variety wherever possible.

During the ginning operations, two lint samples are drawn from each bale of raw cotton for grading and stapling by a check grader who grades against the World's Universal Standard for American Upland Cotton. As the grade and staple length of each container of seed-cotton contributing to each bale of raw cotton is known, the efficiency of the seed-cotton grading and ginning operations can be maintained, thus ensuring that each farmer's cotton is processed in a manner that will permit the Commodity Board obtaining the fullest possible value of it.

It is obviously desirable to reduce the number of cotton varieties arriving at a ginnery to the barest possible minimum required to meet the demands of the districts forwarding cotton to it, if the ginning and pure-seed operations are to be maintained on a highly efficient basis. Each season pure seed of each commercial strain is allotted to sufficient growers to produce the estimated planting requirements for each strain in the following season. These growers normally plant on land not under cotton in the previous season, and which is at least a half mile from any other strain. The high-grade cotton produced by such selected

growers is accumulated according to strain, grade, and staple until sufficient is available to warrant the expense of cleaning the ginning plant of all seed prior to ginning the pure seed. As it is necessary to have replacement stocks to maintain or in some cases, improve the standard of the commercial stock of a variety, it can be appreciated that the maintenance of pure-seed stocks of several varieties at a ginnery increases the cost of, as well as complicates, the ginning operations.

It is highly desirable, therefore, if a whole district cannot successfully grow one variety, that groups of farmers grow only that variety known to be suitable for their particular conditions. Such groups will assist the field staff of the Department of Agriculture and Stock in arranging for the production of planting seed, as well as in the carrying out of the advisory and investigational work. The farmers will also have the benefit of each other's experiences, and where a farmer fails to obtain a satisfactory return he may be able by comparing his methods with those of successful neighbours, to improve his yields. Where, however, each neighbour grows a different variety, the comparing of methods is not a sound procedure, owing to the fact that the varieties frequently respond differently to climatic conditions. In some districts the lack of community one-variety growing has handicapped the work of ascertaining the most suitable soils for cotton, the best variety to grow, and the correct cultural methods to use in growing it.

In some districts where each farm includes both fertile alluvial flats and slopes of lesser fertility, it has been noted that some farmers try to grow the one variety on both soil types. This is frequently inadvisable, particularly if there is a marked difference in the fertility of the two types of soils. In such instances the most suitable variety for the fertile alluvial soils is likely to react severely to stress conditions in midsummer if it is planted on the less fertile and generally shallower soils of the slopes. Consequently, in these areas the farmers must plant varieties adapted to their main soil types. It is considered, however, that it would be more advisable for such farmers to decide what are the best crops to grow on each of their soil types. They can then concentrate on determining the most efficient methods for growing cotton on their soil type which appears to be the most logical for this crop. This would allow of one variety growing within each group with similar conditions and would also simplify the cultural problems of a group through the confining of cotton growing to only one general type of soil in their area.

Summary.

Although it does not appear possible to develop cotton growing in Queensland on an extensive community one-variety basis, the system evolved in this State, whereby a grower organization controls the ginning and marketing and the Department of Agriculture and Stock is responsible for the breeding and distribution of planting seed and the grading of the resultant cotton, gives the cotton farmer most of the advantages of recent developments of this kind overseas. In many instances, by having a choice of varieties according to his soil type, the farmer undoubtedly improves the chances of obtaining satisfactory returns. Wherever possible, however, a group of farmers with comparable conditions should grow only the variety suited to their major soil types. By concentrating on learning how to grow to the best advantage the selected variety on their most suitable soil for it, the farmers will get better returns than are realized when varieties are changed yearly or a single variety is grown on every soil type on the farm.

Vegetable Production

Vegetable Growing in North Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

PART 2.

Fertilizers.

ARTIFICIAL fertilizers are necessary to obtain best results from vegetable crops, but they will give maximum results only when used as a supplement to green manure and stable manure. It must be realized that artificial fertilizers will not take the place of green manure, and, conversely, that green manure will not take the place of fertilizers. Green manure supplies the organic matter that keeps the soil in good heart, but it cannot supply minerals which are deficient in the soil since it is dependent on the soil to supply its minerals in the first place. Where minerals are lacking they must be furnished by the application of artificial fertilizers.

In vegetable farming it is now a generally accepted procedure to fertilize the crop rather than the soil; that is to say, a complete fertilizer mixture containing all the main plant foods necessary to grow the crop is applied, rather than only those ingredients in which the soil is known to be deficient. This considerably simplifies fertilizer practice by limiting the number of fertilizer mixtures needed, and is quite satisfactory in most instances. If the soil is heavily supplied with one or more plant foods in available form, or if it is very deficient in one or more of them, the standard mixture does not then give such satisfactory results as a special mixture put up to meet the special conditions. The mixture that is found to give best results on most of the alluvial country is one with a formula of approximately 4-12-5 or 5-13-5; that is, 4 per cent. nitrogen, 12 per cent. phosphoric acid and 5 per cent. potash, or 5 per cent. nitrogen, 13 per cent. phosphoric acid and 5 per cent. potash. Mixtures with approximately these formulae have been found generally suitable as a basal (i.e., pre-planting) fertilizer for most vegetable crops. Some crops, such as greens, require additional fertilizers in the form of top dressings. The special fertilizers required for various crops will be dealt with later in connection with the individual crops.

The highly acid red soils of the coastal belt and of some of the Atherton Tableland areas which lie east of the Barron River have special requirements. These soils are very deficient in lime, potash, and available phosphate. The neutral or alkaline soils of parts of the Burdekin and Don River areas and the red soils of the Atherton Tableland maize belt are well supplied with phosphate and potash. The acid soils need lime and a fertilizer mixture containing high proportions of phosphate and potash, whilst on the neutral soils no lime is needed and a mixture with lower percentages of phosphate and potash is suitable.

In applying fertilizer, some care must be exercised in placing it in the soil in such a position that the plants will obtain the greatest benefit from it. The basal dressing applied before planting the seed or seedlings should be well mixed with the soil immediately below the rows in which the seed or plants will be set. It should be placed so that it will be about 2 inches below the position the seed or seedling will occupy. Under no circumstances should the fertilizer be so placed that the seed comes into direct contact with it, or "burning" will result. If it is proposed to fertilize after planting, the fertilizer should be banded to a strip 2 inches to 4 inches to the side of the seeds or plants and slightly below their level.

Many soils have a tendency to fix phosphates, making them unavailable to plants. By concentrating the fertilizer in a band the plants are enabled to obtain some of the phosphate before it becomes "fixed."

Rate of application of fertilizers varies according to the intensity of cropping and the class of soil. An average dressing is about 5 cwt. per acre. At this rate of application the quantity of fertilizer to be applied per 100 feet of drill is as follows:—

With drills 21 inches apart $2\frac{1}{4}$ lb. per 100 feet.

With drills 24 inches apart $2\frac{1}{2}$ lb. per 100 feet.

With drills 27 inches apart 3 lb. per 100 feet.

With drills 30 inches apart $3\frac{1}{4}$ lb. per 100 feet.

With drills 36 inches apart $3\frac{3}{4}$ lb. per 100 feet.

Sowing.

This operation is carried out direct to the field with some crops, such as carrots, beet, beans, peas, radish and cucumber, and to seed-beds for subsequent transplanting to the field with other crops, such as all the cabbage family, egg plant, tomato and capsicum. Some crops, such as lettuce, choy (or Chinese cabbage), and indeed any of those usually transplanted, may also be sown direct to the field. Sowing to seed-beds has the advantage of more effective control of the factors affecting germination, hence this method is desirable when field conditions are unfavourable for good results. With suitable field conditions, however, direct sowing to the field will usually result in earlier harvesting by at least a week, owing to the temporary setback received by transplants.

When sowing seed direct to the field a power or hand-operated wheel planter is the most efficient planting machine. When large fields are to be sown the multiple-row, power-operated machine is desirable on account of the saving of labour and seed, the even and regular planting that it permits, and the assistance thereby given to subsequent cultural operations. On smaller areas the hand-operated, single-row wheel planter is quite effective and gives the advantages of the power machine on a smaller scale. There is also an indirect advantage to be obtained from machine planting. Machines will not operate efficiently in land that is not properly prepared for seeding, hence the use of a planter necessitates effective seed-bed preparation. Hand planting should be used only on garden areas. On a commercial scale it is undesirable, because it is not possible to regulate accurately either the rate of sowing or the depth of planting, and the amount of labour involved in this method is large.

Depth of planting varies with the variety of seed and also with the soil and climatic conditions. In the autumn months—March to May—

when there is good soil moisture and the soil temperature is moderate, shallow planting will give good results. Later in the year, during the dry spring months when soil moisture is less and the surface soil temperature is rising, deeper planting is desirable. If irrigation is available, shallow planting may be the general rule at all seasons of the year. The depth of planting recommended for various seeds, when optimum field conditions prevail, is given in Table 1, together with the recommended rate of sowing.

TABLE 1.

Crop.	Seeding.*	Seeds per Oz.	Rate per 100 ft. Drill.	Seeding per Acre.	Depth planting (Inches.)	Duration of Crop (Weeks.)	Approximate Yield. (Tons per Acre.)
Bean, French	a	100	8 oz.	$\frac{3}{4}$ bus.	$\frac{1}{2}$ -1	6-8	2-4
Bean, Long	a	200	4 oz.	40 lb.	$\frac{1}{2}$ -1	6-12	5
Beet	a	1,500	$\frac{1}{2}$ oz.	4 lb.	$\frac{1}{2}$ -1	10-15	5-8
Broccoli Sprouting ..	b	10,000	60-70 plants	4 oz.	$\frac{1}{2}$ -1	12-20	5
Cabbage	b	7,500	60-70 plants	4 oz.	$\frac{1}{2}$ -1	10-12	10
Carrots	a	20,000	$\frac{1}{2}$ oz.	2 $\frac{1}{2}$ lb.	$\frac{1}{2}$ -1	10-12	5-8
Celery	b	80,000	150-200 plants	2 oz.	$\frac{1}{2}$ -1	16	6
Choy	b	7,000	80 plants	4 oz.	$\frac{1}{2}$ -1	6	10-15
Cucumber	a	1,000	$\frac{1}{2}$ oz.	2 lb.	1-2	8-9	6
Egg Plant	b	6,000	50 plants	4 oz.	$\frac{1}{2}$ -1	15-20	5
Kohlrabi	b	8,000	200 plants	2 lb.	$\frac{1}{2}$ -1	10	6
Lettuce	a & b	20,000	100-120 plants	1 lb.	$\frac{1}{2}$ -1	8-10	5-8
Parsnip	a	7,000	$\frac{1}{2}$ oz.	3 lb.	$\frac{1}{2}$ -1	20	4
Peas	a	100	1 lb.	1 bus.	1-2	10-20	1
Peppers and Capsicums	b	4,500	$\frac{1}{2}$ oz.	3 oz.	$\frac{1}{2}$ -1	12-20	5
Radish	a	4,000	$\frac{1}{2}$ oz.	8 lb.	$\frac{1}{2}$ -1	4	5
Shallots	a		200-300 bulbs		2-3	6-10	4
Spinach	b	3,000	1 oz.	8 lb.	$\frac{1}{2}$ -1	6-8	6
Spinach (Summer) ..	b	100,000	$\frac{1}{2}$ oz.	2 oz.	$\frac{1}{2}$ -1	5-6	6
Spinach (New Zealand)	b	300	1 oz.	4 lb.	1-2	8-10	6
Tomato	a	10,000	50 plants	2 oz.	$\frac{1}{2}$ -1	10-12	3-5
Turnip	a & b	13,000	$\frac{1}{2}$ oz.	1 $\frac{1}{2}$ lb.	$\frac{1}{2}$ -1	10-12	6-8

* Sown direct to field.

(b) Sown to seed-beds for transplanting to field.

Seed-bed Treatment.

When sowing is made to a seed-bed or box for subsequent transplantation it is possible to arrange for optimum conditions for healthy and sturdy growth. In order to minimise risk of soil-borne diseases being carried over from one crop of seedlings to the next, it is desirable to select a fresh area for each set of seed-beds. A site should be selected free from the possibility of contamination by drainage from infected land. Close proximity to a good water supply is also essential. Partial sterilization of the seed-bed soil is recommended wherever possible, and is very desirable in the case of land known to be infested with nematodes or fungi. The simplest and most effective method of sterilization is burning, and this method has the added advantage of destroying weed and grass seeds in the soil, thus ensuring a weed-free stand of seedlings. The firing of the beds is done with wood in sufficient quantity to heat the soil 6 to 8 inches deep to a temperature of 180 deg. to 200 deg. F. This temperature should be reached as rapidly as possible and maintained for ten minutes, and the soil then rapidly cooled. The fire should not be made so fierce that the soil is burnt, as this destroys all life, including nitrifying and other beneficial bacteria.

The treatment of small quantities of soil, such as are required for seed boxes, by the heat method may be carried out by heating the soil in shallow trays placed in an oven, or alternatively by steaming it. The equipment necessary for steaming soil consists of a steamer such as a

40-gallon drum standing on fire-bars. A small quantity of water placed in the bottom of the drum generates steam, which passes through several shallow, perforated trays that hold the soil, arranged above one another and clear of the water. The top of the outer container should be covered first with a bag to absorb moisture from the condensed steam and then with a timber or iron lid. A thermometer placed in the soil of the trays assists in determining whether the sterilization process is being satisfactorily carried out. In this method of sterilization hot, live steam is essential to success, otherwise the steam condenses too readily and saturates the soil with moisture without raising it to the required temperature.

Soil disinfection against various fungous organisms may be carried out by the use of formalin solutions. The recommended application for a moist soil is a 2 per cent. solution of commercial formalin (1 gallon of formalin in 50 gallons of water) watered on at the rate of 5 gallons or more per square yard. A 1 per cent. solution of formalin applied at the rate of 10 gallons per square yard is used on dry soil. A covering of sacks is allowed to remain on the beds for two or three days and the beds are then aired for about ten days before sowing the seed.



Plate 109.

A PROPERLY TREATED SEED-BED
SHOWING WEED-FREE GROWTH AND
REGULAR STAND OF SEEDLINGS.

Seed boxes are only suitable for the raising of small numbers of plants, hence are more useful for the home gardener and small market gardener than for the large-scale grower. The boxes have an advantage, however, in that they can be insulated from earth contact to prevent invasion by seed harvesting ants, which in some seasons cause considerable loss in small-seeded types of vegetables. The boxes also have the advantage, for the raising of early seedlings during the tropical wet season, of being easily moved into cover during rain and into the open during fine periods. The boxes should be deep enough to hold about four inches of soil, and the soil used in them should be a carefully prepared potting loam of open texture, good moisture-holding capacity, and reasonably well supplied with plant foods.

Seed-beds, after sterilization, should be carefully dug over and reduced to fine tilth to fork depth. If the soil is not naturally sufficiently rich a light dressing of complete fertilizer mixture at the rate of 1 oz. per square yard may be broadcast and thoroughly mixed with the soil. If fertilizer is used in seed-bed preparation it is desirable to permit several days to lapse between its application and the planting of the seed in order to allow it to dissolve and permeate the soil. A final digging over and raking down should be given to the bed immediately before planting. Very rich soil is neither necessary nor desirable for seed-beds. Such soil promotes rank growth of succulent nature, giving soft plants which do not transplant readily and which are susceptible to damage and attack by insects or diseases.

In both seed-box and seed-bed planting it is usually considered desirable to plant the seed thinly in rows spaced 3 inches or more apart. The reason for this is to allow free circulation of air between the plants and to give all plants reasonable space for development. Row planting helps to produce stocky plants with good root development, whereas broadcast planting, unless done very thinly, tends to promote spindly growth and disease development.

Seed Treatment.

Many diseases of vegetables are seed-borne. Some, such as damping off, show up whilst the plants are still in the seedling stage, whilst others usually become evident only in more advanced stages of growth. Several methods of seed treatment have been evolved to prevent the development of these diseases, and even though all samples of seed do not carry disease spores it is still a wise policy to make a practice of treating all seed before planting. Several proprietary mixtures are available for the control of different diseases and in addition certain chemical compounds may be used. A further method of treatment that is effective against a number of diseases is the hot water treatment.

Details of seed treatments may be obtained on application to the Plant Pathology Section of the Department of Agriculture and Stock.

Rotational Cropping.

Some regular system of cropping on each part of the farm or plot of land is desirable for many reasons, such as regular replenishment of soil organic matter, balanced removal of plant nutrients from the soil, and checking of insect pests and diseases.

Owing to the rapid maturing of most vegetable crops under the tropical conditions of North Queensland, it is usually possible to grow several crops on the same piece of land in one year. Such intensive cropping makes a heavy drain on the soil, however, and unless the cropping is intelligently planned will quickly ruin the land. The very intensiveness of vegetable-growing, whilst making a definite rotational cropping plan difficult, renders such rotation all the more necessary. It is therefore desirable to spend some time in drawing up a cropping plan to cover each field or plot for several years according to the length



Plate 110.

The Annual Green Manure Crop round which the Rotation should be Built.—A heavy cover of cowpea for ploughing under.

of rotation decided upon. With quick-maturing crops the factor having the greatest bearing on length of rotation is the control of pests and diseases. Certain crops are hosts for specific diseases, hence they should not occupy the same piece of ground more than once during the period that the particular disease will live in the soil. Three or four years has usually been found to be the minimum safe period for the control of these soil-borne diseases. Certain varieties of vegetables that are resistant to their specific diseases have been developed, however, and the use of these resistant varieties allows the adoption of a shorter rotation.

The annual green manure crop during the wet-season period should be the base upon which to build the rotation. This should be followed in succession by crops that will, as far as possible, balance one another in their draw on the plant foods in the soil. For instance, a crop that draws heavily on the nitrogen content of the soil should be followed by one that requires a greater proportion of potash or phosphate; one that draws most of its requirements from the surface soil should be followed by a crop with a deep-feeding root system; a crop that is tolerant to acid conditions should follow one that draws on the lime content.

Table 2, which shows the degree of acidity-tolerance, the type of root system, and the climatic requirements of various crops, will assist in working out appropriate rotation tables. The crops marked "cold" should be grown only on the highlands during the winter months. Coastal temperatures, even in the winter, are rarely low enough to enable good commercial crops of these vegetables to be produced, although occasionally the home gardener will be able to produce small quantities under special conditions. Plants marked "moderate" will usually withstand light frosts and thrive under temperatures up to about 80 degrees F. Those marked "hot" require that the temperature should be always above about 60 degrees F., whilst those marked "tropical" thrive best when the temperature is consistently high.

TABLE 2.

Intolerant to Acid Soil. (Optimum pH* over 6.0.)	Moderately Tolerant. (Optimum pH over 5.5.)	Very Tolerant. (Optimum pH over 5.0.)
Asparagus (D) C	Cabbago .. (S) C-M	Beans .. (S) H
Beetroot (S) M	Carrot .. (D) M	Brussels
Broccoli, Green ..	Choys .. (S) M	Sprouts .. (S) C
Sprouting .. (S) M	Cucumber .. (D) H-T	Egg Fruit .. (D) H-T
Cauliflower .. (S) C	Pepper .. (D) H-T	Endive .. (S) M
Celery (S) C	Silver Beet .. (S) M	Kohlrabi .. (S) M
Lettuce (S) M		Parsley .. (S) M
New Zealand		Pea (D) C
Spinach (S) H		Radish .. (S) M
Okra (D) H-T		Rhubarb .. (D) C
Parsnip (D) M		Squash H
Spinach (S) C		Swede Turnip (D) M
		Sweet Corn .. (D) H
		Tomato .. (S) H

Key : S = Shallow rooting.
C = Cold.

D = Deep rooting.
M = Moderate.
H = Hot.

T = Tropical.

* pH is the soil chemist's method of expressing soil acidity. A neutral soil has pH of 7, a very acid soil a pH of 4-5.

By using this table and referring back to Table 1, which gives the average duration of the various crops, a planting schedule for either

coastal or highland areas may be drawn up. For instance, the following are two rotations of three-year duration that would be suitable in some coastal areas:—

ROTATION 1.

1st year.	2nd year.	3rd year.
Green manure (legume).	Green manure (legume).	Green manure (legume).
Carrots	Cucumber	Lettuce
Beans	Choys	Swede turnip
Peppers	Tomatoes	Gramma pumpkin
	Long beans	

ROTATION 2.

1st year.	2nd year.	3rd year.
Green manure (legume).	Green manure (legume).	Green manure (legume).
Cucumber	Choys	Lettuce
Beetroot	Tomatoes	Cabbage
Beans	Sweet corn	Squash
Egg fruit		

Each farmer should draw up rotation schedules to suit his own conditions of soil and climate; and consideration should also be given to the requirements of his market, since it is useless including a crop for which there will be no demand. The farm should be mapped out, a schedule drawn up for each field or plot, and that schedule strictly adhered to.

Irrigation.

As has been already pointed out, irrigation is a requisite of successful vegetable farming or market gardening in all parts of North Queensland. In no part of the northern area is the rainfall spread sufficiently evenly over the whole year to enable successful growing without irrigation. Successful irrigation practice requires careful observation on the part of the farmer. No general directions can be given as to either quantity of water to be applied or frequency of the applications. These matters depend on local conditions of soil, location, climate, and season, as well as the type of crop, all of which are variable factors. By close observation the farmer may find that different parts of his farm require different amounts of water, and that the frequency requirement also varies. The only way in which he can ascertain his irrigation requirements is by trial. Water must be applied until all the soil to the full depth of the roots of the crop has been thoroughly wetted. Water in less amount than this is of doubtful value—it is, in fact, of the same value as the light shower known to the farmer as “grass rain”—for only the surface roots of the crops are able to absorb it. Such watering, if repeated, will influence the plants towards surface rooting, when they will suffer the risk of drying out and wilting. Over-watering is just as serious as under-watering, since it is a costly waste of time, labour, and fuel, and carries much of the soluble fertilizer with the water to the lower depths of the soil where it is out of reach of the plants. The farmer should therefore make actual tests of his soil during watering, with a shovel or soil auger, to ascertain the depth to which the water has penetrated. The tests should be made wherever the soil varies, as the change in texture of the soil will probably mean a variation in the rate of water penetration. A penetration chart based on these trials can be drawn for the farm. On future occasions it will then only be necessary to refer to the chart to ascertain the length of time a particular field must be watered to give a penetration to the desired depth.

The simplest and cheapest form of irrigation is the gravity-fed furrow system, but it is only rarely that land is so situated that the farmer has the advantage of such a supply. Where a stream or spring is available from which water can be gravitated to the vegetable land full use should be made of it. In such an event the water may be led in an open drain if the soil is not of too open texture, or alternatively may be conveyed in pipes to the field.

Failing a gravitational supply, plant must be installed for pumping the water. This may take the form of a windmill and tank, or even a hand pump, for a small home garden; but a power-driven centrifugal pump is necessary for the irrigation of any larger area. The centrifugal type of pump is designed to give a high rate of delivery of water where the lift is small and the discharge line short. These pumps are made in one, two, and three stages to meet various requirements, the higher stages being more effective under difficult operating conditions than the single stage. Various sizes are made, such as 2 inch, 3 inch, 4 inch, &c., the sizes referring to the diameter of the pump discharge outlet. The size governs the maximum output of the pump in gallons of water per minute, and is one of the main determining factors in the selection of a unit. Before installing a pump, the farmer must first assure himself of the quantity of water at his disposal. A flowing stream or a lake is generally the most satisfactory source of supply. In the Burdekin and Don deltas and some of the dry watercourses of the Charters Towers district, large streams of water running underground in gravel beds provide adequate reservoirs on which to draw for the operation of centrifugal pumps. Generally speaking, wells and small lagoons are quite unsuitable for this type of installation.

The size of pump selected should be sufficiently large to enable the delivery of at least an inch of water per acre per week over the whole area to be irrigated. As an inch of water over an acre equals 22,000 gallons, this means that the weekly capacity of the pump must be 22,000 multiplied by the number of acres. In a 10-acre farm, for example, this amounts to 220,000 gallons per week. A good 3-inch pump working at maximum efficiency would deliver this quantity in twenty-two to twenty-five hours, whilst a 4-inch pump, working under the same conditions, would require fourteen to sixteen hours. If a small stream is to be drawn upon, the farmer would be wise to obtain an estimate of its flow during the dry period of the year, and regulate the size of his pump and consequently the size of his irrigated area accordingly, taking into consideration the riparian rights of his neighbours lower down the stream.

Power for the operation of an irrigation pump may be provided by an electric motor, a stationary engine or a farm tractor, and the pump may be direct coupled or belt driven. A very useful type of installation where the farm has a long frontage to the water supply and pumping points can be located at intervals along the frontage is one in which the pump and motor are mounted on a carriage that can be towed from place to place. Whatever arrangement is adopted, and whatever the motive power used, there should be an ample reserve of power above that required for the efficient operation of the pump. This is desirable to curtail wear and tear, which increases rapidly as the maximum load of the motor is approached. Table 3 indicates the approximate horse-power required to pump water against various total heads from 20 feet to 100 feet. Total head is the pressure against which

the water is to be pumped and is usually expressed in feet. It consists of the sum of (a) the vertical height of the highest part of the delivery line above the intake water level, called the "Static head," (b) the pressure necessary to overcome the friction in the pipes, and (c) the pressure required to operate sprinklers if they are used.

TABLE 3.

Discharge. Gallons per Minute.	Horsepower Required to Pump against Total Heads of								
	20'.	30'.	40'.	50'.	60'.	70'.	80'.	90'.	100'.
50	0.5	0.76	1.01	1.26	1.52	1.77	2.02	2.27	2.53
100	1.01	1.52	2.02	2.53	3.03	3.54	4.04	4.55	5.05
200	2.02	3.03	4.04	5.05	6.06	7.07	8.08	9.09	10.10
300	3.03	4.55	6.06	7.58	9.09	10.61	12.12	13.64	15.15
400	4.04	6.06	8.08	10.10	12.12	14.14	16.16	18.18	20.20

Two methods of irrigation are open to the vegetable grower, namely furrow irrigation and sprinkling. The lie of the land and the type of soil very largely decide whether furrow irrigation can be employed successfully. For this method the land must be flat and have an even and unbroken surface, so that furrows may be open beside the vegetable rows to carry the water. Bumps and hollows must be carefully graded out so that the furrows contain neither high spots nor depressions, both of which impede the regular flow of water and interfere with the even watering of the field. If the field has a slope, rows must be planted and the furrows struck on the contour to obtain the slow running of the water necessary to prevent erosion and to ensure proper saturation. Furrows up to 200 yards long may be satisfactorily irrigated by this method. The best length for the furrows depends largely on the texture of the soil. On heavy soils the water should be spread over a greater length of furrow than on loams and allowed to run for a correspondingly longer period, since the heavy soil absorbs water more slowly than the loam. Very porous and sandy soils cannot be satisfactorily watered by this method owing to the immediate penetration of most of the water to the lower soil levels, thus preventing run in the furrows.

Sprinkler irrigation operates efficiently whether the land is flat or broken, and whether the soil is light or heavy. It is, however, much more costly to instal. Plants using light, portable pipes with quick-coupling joints for both main and sprinkler lines are most suitable for vegetable crops. The portable line can be readily moved out of the way for cultivating operations, and when in use it can be readily moved from one field to another so that a large area may be watered with a relatively small amount of pipe.

The use of pipes and spray lines introduces factors of friction head and pressure head into the discussion of a suitable engine and pump. These two items, added to the static head, give the total head against which the engine and pump will be required to work. For any particular size of pipe, friction head increases with an increase in the quantity of water pumped, but when the quantity of water is constant the friction head decreases rapidly with an increase in the size of the pipe. Table 4 shows the number of feet for each 100 feet of galvanised irrigation pipe that must be added in the total head.

TABLE 4.

Discharge. Gallons per Minute.	Friction Head per 100 ft. Pipe, Internal Diameter.				
	3".	4".	5".	6".	8".
	Feet.	Feet.	Feet.	Feet.	Feet.
25 .. .. .	.2	.05	..	..	..
50 .. .. .	.74	.18	.06	..	..
75	1.6	.39	.13	..	..
100	2.76	.68	.22	.09	..
150	5.96	1.46	.49	.20	..
200	10.31	2.53	.84	.35	.08
300 .. .. .	..	5.46	1.82	.74	.18
400 .. .. .	..	9.42	3.15	1.29	0.31

Pressure head to be added in the total head is calculated by multiplying the pressure in pounds per square inch at which the sprinklers operate by 2.3; thus sprinklers operating at 20 lb. per square inch add $20 \times 2.3 = 46$ feet to the total head.

Cultivation.

The chief function of cultivation is the destruction of weeds. Since weed growth competes with the vegetable plants for both moisture and plant food, its eradication in the earliest stages of growth is most desirable. In the young seedling stage the weeds have not had time to develop the extensive root system that not only competes with the vegetables but also makes them difficult to destroy. Cultivation at this period attains the best results with minimum labour and with only shallow working of the soil. This last point is an important one for two reasons—it ensures the minimum disturbance of roots of the shallow-rooted vegetables, and it also prevents the bringing to the surface for early growth of weed seed too deeply buried to germinate. Strictly speaking, each cultivation should be slightly more shallow than the preceding one to make sure of this dual advantage. As well as cultivating for weed control the soil should be stirred as soon after irrigation or rain as it is in a fit condition for working. This is necessary to restore the surface tilth.

Cultivating implements are available to suit all types of crops and all areas from the home garden to the large farm. In the home garden chipping and dutch hoes and the weed eradicator will deal with the tillage. In small market gardens hand-wheel hoes with various attachments for close cultivation and horse-drawn implements for inter-row work are suitable. Small garden tractors for the larger market gardens and field tractors for the vegetable farms are desirable. Both these power implements are fitted with tool bars to take various types of cultivating tools for the tillage of several rows simultaneously. They have been developed in America to meet the requirements of the large vegetable-growing industry of that country. The garden tractor equipment has been tried out in northern vegetable areas with considerable success, and both this and the field tractor machinery have operated satisfactorily in southern States. The great value of these machines on commercial areas is that they reduce hand work to the absolute minimum owing to the exactness with which they may be set to cultivate right up to the rows. Indeed, certain attachments are also manufactured for the mechanical thinning and weeding of the rows. In order that the greatest benefit may be obtained from the machines it is necessary that the land be properly prepared before planting the crop, and where very fine work is required the land should also be free of stones.

PLANT PROTECTION

Fruit Fly Control.

A. W. S. MAY, Assistant Research Officer, and N. E. H. CALDWELL,
Assistant Research Officer.

MANY cultivated fruits are subject to attack by flies whose maggots feed within the fruit. Externally, the presence of the maggots is indicated by skin discolouration or premature ripening. Internally, their activities in eating and tunnelling through the tissues (Plate 111; fig. 1) usually set up rots which frequently result in premature fruit fall and always make the fruit unfit for marketing.

Deciduous and citrus fruits are very susceptible to attack, chiefly by the Queensland fruit fly*. Serious losses due to this species also occur in grape, mango, passion fruit, and papaw crops. Tomatoes and cucurbitaceous crops, such as cucumbers and melons, are sometimes attacked by one or more species of fruit fly, the most important being the cucumber fly†, which is also frequently associated with damage to papaws. In the far north, bananas are sometimes severely attacked by the banana fruit fly‡, which may "sting" the fruit while it is still immature. This fly does not occur in other parts of the State but other species occasionally infest bananas if harvesting is delayed and the fruit ripens in the plantation.

Life History and Habits.

Fruit flies are mostly reddish-brown insects with conspicuous yellow markings on the body, and wings which are more or less clear, except for one dark band along the front margin and another towards the base of the wing. Adults may be found under the leaves or, if conditions are favourable for egg-laying, on the surface of the fruits. The life history of the Queensland fruit fly is typical of all pest species. The cream-coloured, slightly-curved eggs (Plate 112; fig. 2) are laid in punctures made by the female fly in the skin of selected fruits. Each puncture may contain as many as seven eggs. During warm weather, the eggs hatch in two or three days and the creamy-white maggots (Plate 112; fig. 3) feed inside the fruit and attain their full size of about one-third of an inch within a week. Upon attaining maturity, the maggots leave the fruit which, by that time, has usually dropped from the tree, and enter the soil where each forms a hard brownish pupal case (Plate 112; fig. 4). In the pupal stage, the maggot undergoes a complete transformation into the adult fly (Plate 112; fig. 1) which escapes from the pupal case and forces its way to the surface of the soil. In summer, only two or three weeks elapse from the time the eggs are laid until the adult fly emerges from the soil; in cooler weather, however, this period may be considerably longer. The pest is usually inactive during the winter, though frequently present in citrus orchards in the adult stage.

* *Strumeta tryoni* Frogg.

† *Austrodacus cucumis* French.

‡ *Strumeta musae* Tryon.

Control Measures.

The control measures discussed below apply mainly to deciduous and citrus fruits but may, with appropriate modifications, be suitable for other crops. They include luring, bait spray application, orchard hygiene, and the treatment of breeding grounds outside the orchard.



Plate 111.

FRUIT FLY ATTACK.

Fig. 1.—Fruit fly infested apple. Fig. 2.—Fruit fly sting on passion fruit.
Both figures half natural size.

[Drawings by I. W. Helmsing]

Luring.—Luring is the most satisfactory means of reducing fruit fly populations and the following lures, materials for which can be readily obtained, are recommended:—

Lure 1. Formula.—Rind and rag of one ripe or ripening orange, about $2\frac{1}{2}$ inches in diameter; concentrated aqueous ammonia, 18 per cent., 6 teaspoonfuls; tank water, quarter pint.

The orange rind is shredded with a sharp knife. The ammonia and the water are added and the mixture is kept in a tightly stoppered bottle for at least 24 hours before using; this stock mixture can be stored under these conditions for periods up to one month. To make the lure ready for the traps, two tablespoonfuls, i.e., eight teaspoonfuls, of the liquid are added to $3\frac{1}{2}$ pints of tank water.

This lure catches practically no insects other than fruit flies and fouling of the traps is therefore negligible.

Lure 2. Formula.—Maize meal or pollard, 5 level teaspoonfuls; ammonium carbonate (pure), 1 level teaspoonful, or 18 per cent. aqueous ammonia, 6 teaspoonfuls; tank water, $3\frac{1}{2}$ pints.

This lure is ready for use when mixed and catches a number of insects other than fruit flies. Fouling of the traps is greater in the formula containing pollard than is that containing maize meal.

Lure 3. Formula.—Pollard, 2 level teaspoonfuls; cloudy ammonia, 1 teaspoonful; tank water, 1 pint.

This lure can be placed in the traps as soon as it is prepared. It catches fruit flies in large numbers, being apparently more efficient in spring than in autumn, at least in citrus districts. Unfortunately, it catches large numbers of

blow flies which tend to foul the traps after a few days and reduce their attraction to fruit flies. This lure is inferior to lures 1 and 2.

The lure is placed in the common glass fly traps which are then hung in good trapping trees. Most growers are familiar with such trees; they are usually large, leafy and well sheltered. The fly population tends to congregate in parts of the orchard where the fruit is maturing, and trapping trees within, and near to, the block needing protection should therefore be selected at any particular time.

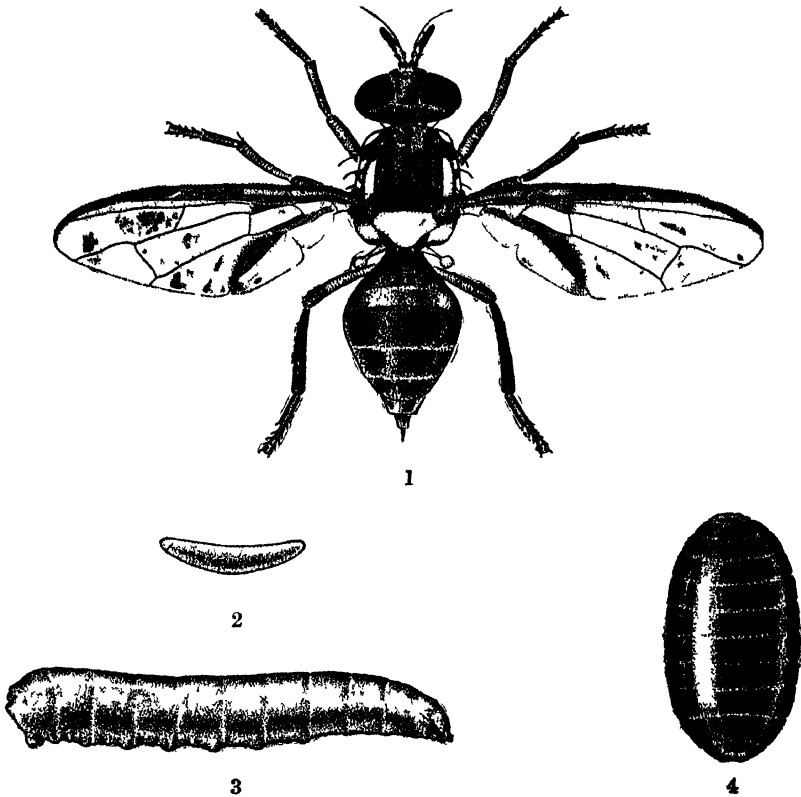


Plate 112.

QUEENSLAND FRUIT FLY.

Fig. 1—Adult $\times 7$. Fig. 2.—Egg $\times 16$. Fig. 3.—Larva $\times 7$.
Fig. 4.—Pupal case $\times 7$.

[Drawings by William Manley]

The traps should be hung within the tree away from the direct rays of the sun. Where possible, the bottom of the trap is placed just above a few leaves which serve as a landing platform for the flies. Some growers make use of a wooden platform for the traps which are then supported on short legs so that a space of approximately one inch is allowed between the platform and the bottom of the trap.

As many as six traps can be used to advantage in large trees when intensive trapping is undertaken. Such intensive trapping, i.e. distribution of the available traps in a limited number of selected trees, yields excellent catches and also simplifies re-charging and inspection. There

is no limit to the number of traps that can be used in an orchard but at least ten to each acre of trees likely to require protection at any one time, should meet normal requirements.

Each trap requires about 6 fluid oz. of lure, and is filled at intervals of six days, or more frequently if hot weather causes rapid evaporation of the liquid. Before recharging, the traps should be emptied and then washed in water to remove any sediment adhering to the glass.

Luring should commence in deciduous orchards in early October, when single "pilot" traps are placed in each of six to twelve selected trapping trees throughout the orchard. At the same time, the remainder of the available traps are cleaned and made ready for immediate use when required. Daily inspection of these "pilot" traps, which are, of course, recharged every six days, gives a constant check on fly activity. As soon as an obvious increase in the catch is detected, all available traps should be charged and hung in the orchard, their distribution being so arranged that trees where the flies appear most plentiful are equipped with the majority of the traps. Full-scale luring may be necessary six weeks before the earliest fruit in the orchard matures, and once begun, should be continued until the crops are all harvested. Any cessation of trapping may permit a gradual increase in the pest population to relatively high levels at a time when ripe fruit is on the trees and lures tend to lose some of their effectiveness.

In citrus orchards, the same procedure is adopted even though the fruit does not become susceptible to fruit fly injury until about three weeks before it reaches maturity. However, flies are usually present in the orchard when very immature fruit is on the trees, and it is therefore necessary to place the "pilot" traps in position at least six weeks before harvesting is scheduled to begin in the earliest maturing varieties. Only in this way can a sudden influx of flies be detected, and prompt counter measures carried out. Full-scale luring may be needed in grape fruit, navels, Emperor mandarin, and other early varieties between late February and the end of April in the more important citrus-producing areas. Though the trees may be carrying mature fruit during May, June, and July, the flies are less active owing to the relatively cool weather at that time of the year. It may then be possible to dispense with control measures. Nevertheless, it is advisable to keep the "pilot" traps charged in case a short spell of warm weather induces activity among adult flies overwintering in the orchard, and full-scale luring has to be resumed. In any case, intensive trapping may again be necessary in early August when the fruit of a late-maturing variety such as Valencia is still on the trees and the "pilot" traps indicate the necessity for it.

No definite dates can be given for the commencement or cessation of trapping operations in the various fruit-growing districts. However, information yielded by "pilot" traps concerning the fly population, coupled with the growers own knowledge of the maturing periods of the fruit, makes decisions on these points relatively simple.

Bait Spray Application.—Fruit flies feed readily on sweet solutions and if such solutions containing a suitable poison are sprayed on to the foliage of the trees, considerable numbers of the pest may be killed in the orchard. Bait sprays of this kind are a supplement to, rather than a substitute for, lures and, where possible, the two measures should

be used in conjunction. The sprays appear to give better results in the drier, inland districts where rain does not interfere too frequently with the application of the spray, and where, possibly, other factors make the bait more attractive to the flies than in the wetter coastal districts.

The bait spray should be applied at six-day intervals on trees needing protection when lures indicate that the pest is active. Treatment should be repeated if rain falls and washes the bait from the tree. Applications are best made with some form of spray pump, though, in the absence of such equipment, it may be splashed onto the foliage with a brush. The spray should be applied to the shady side of well-foliaged trees, preferably early in the morning, and care is needed to avoid unnecessarily coating the fruit with spray. Four gallons of the bait spray will provide a single treatment for approximately 150 trees.

Bait sprays may contain lead arsenate, sodium fluosilicate, or tartar emetic as the poisonous ingredient. A convenient formula containing the first-named poison, which should give reasonable results is:—Lead arsenate, $2\frac{1}{2}$ oz.; sugar, 2 lb.; water, 4 gallons. The efficiency of this formula is apparently improved by replacing the water with an equivalent quantity of fruit syrup prepared by boiling 20 lb. waste fruit in water. Proprietary bait sprays, which merely require the addition of water before use, are marketed in Queensland.

Orchard Hygiene.—Fruit flies should be prevented from breeding in the orchard. If infested fruit is allowed to lie on the ground, the maggots pupate in the soil and eventually give rise to fly populations so large that any control measures are unable to deal with them before a considerable amount of damage has been done. Accordingly, all waste and fly-infested fruit should be gathered at least every three days and treated in such a way that the maggots cannot survive. Methods of disposal include burying, boiling, burning, or immersion in water. The best method of treating large quantities of infested and waste fruit is by means of a pit which should be 6 feet by 5 feet in cross section, 20 feet deep and fitted with a suitable fly-proof cover. Pits of smaller dimensions can be employed if preferred. If the fruit is buried, care should be taken to ensure that it is covered promptly at the end of every six days with at least 18 inches of soil; a lighter covering will not prevent the emergence of flies. Burning also requires attention at least every six days in orchards where this operation is practised, and must be carried out on the actual spot where the fruit is or has been dumped in order to destroy any pupae in the underlying soil. Boiling is effective when it is done as soon as the waste fruit is collected, but if this is not practicable, the fruit should be placed in drums and covered with water pending boiling operations.

Treatment of Breeding Sources Outside the Orchard.—Fruit flies can breed in a very wide range of fruits, and all likely breeding grounds in the vicinity of commercial fruit trees should be ascertained and closely watched. If they are of no commercial value they should be systematically destroyed. If such a course is not practicable, trapping at these centres will often prove very helpful in protecting nearby orchards. If possible, infested fruit in such situations should be destroyed.

Points to Remember.

(1) Luring, bait-spray application, orchard hygiene, and the treatment of breeding grounds outside the orchard are all essential features

in the fruit-fly control programme. The results achieved depend entirely on the efficient application of the recommended measures at the correct times.

(2) Six weeks before the earliest variety is due to mature, "pilot" traps are placed in position and kept charged throughout the season.

(3) When "pilot" traps indicate a rise in the fly population, full scale trapping and bait spray applications are begun immediately.

(4) Waste fruit must be picked up at least every third day.

(5) On every sixth day the lure traps should be washed and recharged, the bait spray should be applied, and waste fruit should be boiled, burned, or buried under 18 inches of soil if it is not emptied into pits fitted with insect-proof covers.

REMOVAL OF SOOTY MOULD FROM CITRUS FRUITS.

Where growers have not been able to deal satisfactorily with scale insects, the sooty mould which accompanies scale infestation will cause some inconvenience. The fungus, as most orchardists are aware, subsists on the sweet secretions of certain scale insects, notably pink and white wax. Except in very severe cases it causes little direct injury to the tree, but the disfiguration of the fruit is a serious matter.

Various methods are used for the removal of sooty mould. In all of them, injury to the rind should be avoided, because it opens the way to infection with blue or green mould in the fruit. With moderate blemishes, a light brushing of the fruit will suffice. If the fruit is badly affected, brushing sufficient to remove the mould may seriously injure the rind. Cleaning the fruit in a rotating barrel partially filled with sawdust is a method commonly used but has little to recommend it. Damaged rind and bruised flesh too often result from this procedure.

If washing has to be resorted to, the fruit should be immersed for about one minute in a solution containing $\frac{1}{4}$ lb. of boracic acid and $\frac{1}{4}$ lb. chloride of lime to each gallon of water. This solution has been used extensively by growers and has been found very satisfactory. After immersion in the cleansing solution, the fruit should be well washed in clean water to avoid a whitish deposit on drying, and then should be dried thoroughly before packing.

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Rearing Calves on Milk Substitutes.

C. R. TUMMON.

AT the present time, some large dairy districts in Queensland are given over almost entirely to the production of milk for direct consumption, and this has given rise to a position in which, in order to rear calves successfully, some substitute for milk must be used.

With milk at the present high price, the incentive is to sell all milk and not bother about rearing calves. By adding the cost of feeding calves on substitute foods, the cost may seem prohibitive, but it should be realised that the cost would be greater if milk were fed alone at its present high price of 1s 3d. per gallon, approximately. The farmer who rears calves from his best cows has, too, the satisfaction of knowing the type of animal he is producing for his future herd. Again, it should be remembered that almost every farmer in some districts is producing milk and not rearing any calves, so that there is likely to be an acute shortage of young stock in a year or two.

In feeding on substitute foods, three important factors should be borne in mind:—

1. Nutritive ratio;
2. Palatability and digestibility;
3. Cost.

1. *Nutritive Ratio*.—The ratio of digestible proteins to digestible carbohydrates for young calves should be 1 : 3-4.

2. *Palatability and Digestibility*.—Unless the food substituted for milk is both palatable and easily digestible, difficulty will be experienced in getting the calves to drink, and stomach upsets may occur.

3. *Cost*.—Where, for instance, pollard may be cheaper in some areas than other concentrate foods, it would be more economical to feed pollard, and vice versa if other concentrates are cheaper.

Amount to be Fed.

The amount of substitute food given to a calf will vary according to its age and size, and also on the type and amount of green food available. For example, when the calf is very young, the percentage of whole milk is greater than when it becomes old enough to eat grass. Then again, if the available grass is good (for instance, young kikuyu), and there is plenty of it, less concentrates are required.

The following procedure for rearing calves from birth to weaning age at six months, using pollard and meatmeal as a milk substitute, is working out satisfactorily on an Atherton Tableland farm. Of course, other concentrates may be used similarly to pollard and meatmeal, varying the amounts used, according to the nutritive ratio. It has been found that if pollard is started too soon, white scours will result, whereas by first introducing a little meatmeal and gradually building up the amount of pollard this trouble does not arise.

For the first week, the calf is fed on its mother's milk. As this milk, or "colostrum" as it is called, is unsuitable for use for human consumption, there is no economic loss in this first week's feeding to the calf. However, the calf benefits enormously by this, and stomach troubles are avoided. This milk is abnormally high in albumen content, and is intended by nature for the calf to give it a good start in life. The amount of this milk given depends on the size of the calf. A calf weighing about 60 lb. at birth requires 6-7 lb. milk daily for the first week, and this is best divided into several feeds during the day, rather than given at only two feeds. The milk must be fed at blood heat (100 degrees F.).

In the second week, fresh milk is partly replaced by substitutes. The change-over should be gradual, although as quick as practicable, as the cost of feeding on milk is prohibitive. For instance, in the second week, the calf gets 6 lb. fresh milk, 2 lb. water and a little meatmeal (tablespoonful); in the third week it gets 4 lb. fresh milk, 5 lb. water, 2 oz. meatmeal and $\frac{1}{4}$ lb. pollard, as well as having access to clean water and succulent grass. The milk is again decreased by 1 lb. the following week and the pollard, meatmeal and water increased. At the end of one month, the calf gets only 3 lb. milk, but the supplements are built up to $\frac{1}{2}$ to $\frac{3}{4}$ lb. of pollard and 4 oz. meatmeal. The pollard and meatmeal are further increased for the second month, the mixture being built up to $1\frac{1}{2}$ lb. pollard and $\frac{1}{2}$ lb. meatmeal daily. At two months the milk is eliminated from the feed. A change of run is then advisable so that fresh, unscoured pastures are available.

If any hay or silage is available, a little may be fed with advantage. As the calf becomes accustomed to eating more grass, the amount of pollard can be again reduced by $\frac{1}{4}$ lb. daily, the meatmeal being kept at 6 to 8 oz. This amount of meatmeal is provided up to the age of 6 months, when the calf should be weaned.

In mineral deficient country, suitable licks should be available. Salt should also be given when necessary.

Maizemeal can be used with equally as much success as pollard, but it must first be soaked in boiling water.

By providing well grassed and shady calf paddocks, dry pens well-ventilated but free from draughts, periodically liming the places where the calves congregate to reduce the risk of worm infestation, and by properly sterilising calf buckets to avoid scours, it will be found that calves may be reared on substitute foods quite satisfactorily.

The Cleansing of Dairy Utensils.

F. C. COLEMAN, Dairy Branch.

DAIRY bacteriologists, factory managers and all personnel associated with the management and control of dairy products, agree that the efficient cleansing of utensils on the dairy farm is among the most important jobs which the dairy farmer has to undertake, and has a pronounced influence on the quality of milk and its products.

Good results will definitely be obtained if cleansing is properly and regularly done, results which will bring benefit and satisfaction to the dairy farmer and factory manager alike. Some time ago, a certain factory adopted the practice of issuing an attractive certificate to each supplier who sent in 100 per cent. choice cream during the year. The dairy farmers concerned took a great pride in the possession of these certificates and were pleased to discuss the matter with any interested person, and to explain how they were able to achieve such results. By this they were encouraged to maintain throughout the year the high standard reached, and would be disappointed if that record were broken by even a single first grade.

The "Model" Dairy and a Contrast.

A visit to these farms all told the same story—an obvious and noticeable neatness and cleanliness of premises, yards and more particularly, utensils. Invariably they were men who relied on something more effective than a kerosene tin of "boiling" water, men who cleansed their equipment regularly, not once a day, but *twice*.

A glance at the separator parts, buckets, strainers and vats hanging up or spread over a bench, will usually indicate whether the owner is likely to get choice grade, first or second grade for his product. Utensils which are bright in appearance and perfectly dry, indicate that they have been properly cleansed and scalded in *boiling* water. Moreover, they smell sweet and clean and will not impart any undesirable odours or taints to the milk or cream for which they are used. In addition, the effect of being left to dry by the extreme heat generated by the boiling water prevents rust.

Take a look at another dairy. Here the separator discs are greasy on top, but more so underneath and covered with droplets of water. The rest of the equipment is the same, drops of water on greasy surface, smelling stale and looking dull. Such conditions will create a similar taint in the milk and cream, and the utensils will rust very quickly, thus bringing nearer the day of necessary replacement, because the utensils were not properly scalded. The result is that germs, invisible enemies which spoil dairy products, have not been destroyed, but given another lease of life.

On the dairy farm, germs obtain access to milk, cream and utensils from the dust of the cowyards, dust and manure from the cows' flanks, udder and tail, from dusty hay, cobwebs and many other sources. The cleaner the premises and surroundings, the fewer germs there will be, but even in the cleanest of dairies they are a menace which has to be dealt with. The only means of effectively countering them is by the application of heat, such as boiling water, which, if applied long enough, will destroy practically all organisms.

Germis which spell spoilage for dairy products thrive best and multiply more rapidly at warm temperatures, hence the vital necessity of cooling to a low temperature when their capacity to multiply is arrested. Heat kills them, hence heat and plenty of it should be applied. The greater the heat and the longer it is applied, the better the kill.

Essential Points in Dairy Practice.

Much too frequently in the past, a kerosene tin only of hot water has been used, the water seldom at boiling or even at scalding point, and certainly not possessing a high germ killing efficiency. With such water, utensils cannot be properly cleansed and first or second grade products usually result.

There are many instances where hot water for the dairy has to be carried from the house, sometimes 200 or 300 yards away, and so much of the heat is lost before the water is used. Again, it is not sufficient to cleanse utensils properly in the morning, and to give them a cleanse with cold water at the second milking. If such a practice is continued it will prove disastrous to grading figures.

Since the coming into use of the copper boiler, the use of the kerosene tin is being discontinued. The most progressive dairy farmers have large boilers, holding 20 or more gallons, preferably bricked in and cemented and supplied with a large wooden lid. This should be placed as close to the wash-up troughs as practicable—within a few feet, if convenient—so that the water, which should be bubbling, can be transferred to the wash-up trough immediately and in ample quantity. The boiler should be under cover for if left in the open a sudden shower of rain will rapidly cool the water.

A single 1,000-gallon tank does not provide an adequate supply of water for washing-up purposes—at least two such tanks are necessary.

If practicable, utensils should be cleaned immediately after milking. If there is an unavoidable delay, all equipment should be covered with cold water, until further attention can be given to it. Boiling water or steam should never be applied until all milk fat, dust and dirt have been removed by cleaning in cold or warm water. If boiling water is used first, the albumen of the milk will coagulate on the utensils, thus rendering cleaning more difficult.

After this preliminary washing, all utensils should be immersed in very hot water to which a quantity of washing soda has been added. They should be scrubbed thoroughly with a good stiff brush so that the bristles penetrate every corner and crevice. Cloths should *not* be used. This procedure should be followed by a further immersion in clean water which is really boiling and to which no soda has been added. Care should be taken to wash the outside as well as the inside of all utensils. In many instances, it is the practice to rinse all articles in cold water after the treatment described, but this is condemned because of possible contamination and the fact that they are left wet.

Where a steam sterilizer is available, a final steam treatment should be given. Where this is not possible, the utensils may be kept submerged in boiling water for at least two minutes. They should then be placed on galvanised iron pipe racks, in a clear, dust-free atmosphere, not on sour smelling, unsanitary wooden benches. Some dairy farmers, knowing

that the sun is an effective germ killer, leave their utensils in the sun, but very frequently right beside a dusty cow yard, exposed directly to serious dust contamination. All equipment should be kept well away from the yard and dust, preferably surrounded by concrete, or a well-grassed area and fenced off.

If clean raw milk is put through clean sanitary equipment, a big advance to the standards desired will have been made.

Influence of Purebred Sires on Production.

THE keeping of records and the culling of unprofitable producers, although of high importance in dairy practice, will not alone tend to any great extent towards increasing production. Any attempt to assemble a high producing lot of animals in this particular way without using a purebred sire of undoubted ability may be a waste of time and effort, for productive capacity is a matter of breeding along right lines. Thus the importance of having a purebred sire from a high producing family is plain.

The dairy farmer who is building up a herd with a foundation of common cows should decide what particular breed of cattle he intends to go in for before purchasing his purebred sire. For use in a herd of this description or even in a herd of high grade cows, the sire is best selected on his pedigree and the milk records of his female ancestors, at the same time giving attention to individuality. Our more experienced breeders of purebred dairy cattle have given close attention to pedigree and production and know just how to interpret them in order to gain results with the matings. On the other hand, the dairy farmer who is not familiar with this subject should get someone with the necessary knowledge to assist him in making the selection of a sire for his herd, as far too many mistakes have been made and are still being made, quite unconsciously, by less experienced dairy farmers, simply because they may not understand the principles of animal breeding.

It is stressed, however, that a good pedigree, which includes ancestors with satisfactory records of production, does not necessarily ensure that the sire in view will be a certain transmitter of the desired dairy qualities; for it has been found sometimes that an animal with a great pedigree has not proved successful as a dairy sire. However, a long line of good ancestors is the best indication any dairy farmer can get of the probable value of a bull before he has proved his ability by the production of his heifers, to transmit his inherited qualities, although the buying of a bull by pedigree with the necessary attention to type will usually be found satisfactory.

—L. VERNEY.

NOTICE TO READERS.

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PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of Australian Illawarra Shorthorn, Jersey, and Ayrshire Societies production records for which have been compiled during the months of January and February, 1944 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.)				
Alfa Vale Florrie 3rd	W. H. Thompson, Nanango	13,092.7	570.26	Reward of Fairfield
Rosenthal Perfect 5th	S. Mitchell, Warwick	10,725.19	419.412	Rosenthal Carbone
Braemar Empress ..	W. Henschell, Yarralua	10,782.59	393.124	Blacklands Gay Lad
JUNIOR, 4 YEARS (STANDARD 310 LB.)				
Brundah Petal	C. O'Sullivan, Greenmount	9,757.65	398.679	Greyleigh Eros
Happy Valley Malba 2nd	R. E. Radel, Coalstoun Lakes	8,170.04	356.137	Sunnyview Artist
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Alfa Vale Sylvia 4th	W. H. Thompson, Nanango	11,747.25	506.706	Penrhos Pansy's Pride
Alfa Vale Laura 5th	W. H. Thompson, Nanango	10,752.15	452.242	Penrhos Pansy's Pride
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Greyleigh Gem 139th (365 days)	W. H. Thompson, Nanango	16,825.2	750.553	Swaulea Bertie
Happy Valley Ada ..	R. R. Radel, Coalstoun Lakes	6,822.92	320.381	Sunnyview Marvel
Navillus Shannon 6th	C. O'Sullivan, Greenmount	7,374.9	300.023	Greyleigh Eros
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Sunnyview Blossom 6th	W. Henschell, Yarralua	10,020.47	416.602	Sunnyview Commodore
Jamberoo Winnie 4th	M. J. Brosnan, Headington Hill	10,919.85	413.887	Greyleigh Valiant
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Sunnyview Kitty 7th	W. Henschell, Yarralua	8,420.81	378.284	Sunnyview Commodore
Happy Valley Sapphire	R. R. Radel, Coalstoun Lakes	7,385.63	323.633	Sunnyview Warden
Jamberoo Marjorie 8th	M. J. Brosnan, Headington Hill	8,296.4	302.104	Valiant of Greyleigh
Happy Valley Lorna	R. R. Radel, Coalstoun Lakes	5,754.39	235.57	Sunnyview Warden
JERSEY.				
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Lermont Heather Bell	J. Schull, Oakley	6,462.3	289.029	Lermont Ambassador
Lermont Fan ..	J. Schull, Oakley	5,792.1	238.42	Lermont Ambassador
AYRSHIRE.				
JUNIOR, 3 YEARS (STANDARD 370 LB.)				
Leafmore Lady Jan..	J. P. Ruble, Motley	5,818.95	277.93	Myola Jellioce
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Leafmore Deborah 2nd	J. P. Ruble, Motley	6,231.2	243.907	Myola Jellioce



The Large White Breed of Pig.

E. J. SHELTON.

THE rise in popular favour of the Large White breed of pig is remarkable for no other breed of pig has achieved such importance in recent years.

It is true that a study of pig production during the past half century suggests the somewhat odd fact, that, while the bacon curer and pork butcher have been increasingly emphatic in their demand for lean meat, they seem to have met with considerable difficulty in getting it. For fifty years in England, bacon curers and others have urged the wider use of the Large White boar in commercial pig production. As long ago as 1887 prominent bacon curers were recommending the Large White breed to farmers; in fact, they went further, and purchased selected boars and distributed them to breeders in different parts of the British Isles.

This persistent demand for lean meat, common also in Queensland, has to a large extent influenced the type of the Large White breed, and in the well-balanced pigs of to-day it is possible to see the value of breed improvement.

The Large White Type.

In outline, the Large White pig resembles the most desirable baconer. The standard of excellence emphasises such important points as length, level back, long and wide quarters, broad and deep hams, light shoulders, a white or pinkish skin free from wrinkles, and a sturdy constitution. Although the value of the Large White for bacon production is now invariably stressed above other characteristics, its usefulness as a general purpose pig is equally significant; many carcass competitions and long experience have testified to this, especially in the Old World. Almost every year since the National Pig Breeders' Association's pork contests, inclusive of bacon weights, were inaugurated, the champion pork carcasses at British shows have been of Large White type. Pig meat of all weights can be produced economically from the pure Large White, while British butchers also favour any pig which shows a cross of this popular breed. Experiments have confirmed the belief of established breeders that bacon and pork produced from Large White pigs is of excellent quality and texture.

Breeding Stock.

Large White sows are tractable and good mothers. The ever-increasing number of such sows kept by commercial pig breeders in all parts of the world speaks for itself. Breeders and feeders whose farms

lie in widely different directions and whose management systems are correspondingly varied find the Large White equally suitable. The boars are of very adaptable type and are specially recommended.

Hardiness.

A breed that is able to thrive in Finland, Russia, and Northern Scandinavia where the cold is intense, and in South Africa, India, Australia and the Malay States, where the thermometer rises beyond any temperature recorded in England, is hardy enough surely.

Carcase Quality.

One of the advantages claimed for the Large White is that when dressing the carcass, the skin is very white and clean; also butchers and curers are not afraid of "seedy cut" nor of the general appearance of the carcass. Time and labour and greater satisfaction results in cleaning and otherwise endeavouring to satisfy discriminating popular taste.

Availability.

Great Britain is still regarded the world over as the stud farm of the world. British-bred Large Whites have been exported in large numbers during the past century, more especially since pig production, developed into the economic importance which it has attained to-day. They are now available in large numbers and of better quality than ever before and the demand, particularly in Australia, is increasing.

The Large White breed also has had remarkable successes in the show ring, both in the live animal and in carcass form. The breed has gained much success in the dairy show bacon contest in London, at the Birmingham Fat Stock Show, at the Smithfield Show, and at many other bacon competitions. In Queensland, the Large White is numerously represented in the stud books. Breeders are realising that they are a safe as well as satisfactory breed.

Care and attention to prevent skin troubles within the Large White breed needs, however, to be stressed, and it is essential that for pigs of the breed ample shade and protection from the effects of severe weather should be provided. Particular attention also should be paid to the selection of strains adaptable to the warmer regions of the State. Given this added care and protection and suitable strains of the breed, there is no reason why the Large White should not continue to increase in importance in the Queensland pig industry.

SOAKING AND GRINDING MAIZE FOR PIGS.

The effect of different degrees of grinding on the digestibility of maize meal and the effect of soaking in water on the digestibility of maize cobs were investigated at an overseas research station. A medium degree of grinding (that is, a coarse meal) was most satisfactory. Soaking reduced the digestibility of maize cobs, apparently because the pigs swallowed them in large pieces instead of masticating them thoroughly.

Mixing cereal meals with water immediately before feeding did not influence their digestibility, but they were somewhat more appetising than in the dry state, so food consumption, and in consequence, rate of live weight gain was increased.

The efficiency of meal conversion was, however, somewhat impaired, suggesting that the feeding of meal in dry form, suitably balanced with a protein-rich concentrate plus mineral, is sound practice.

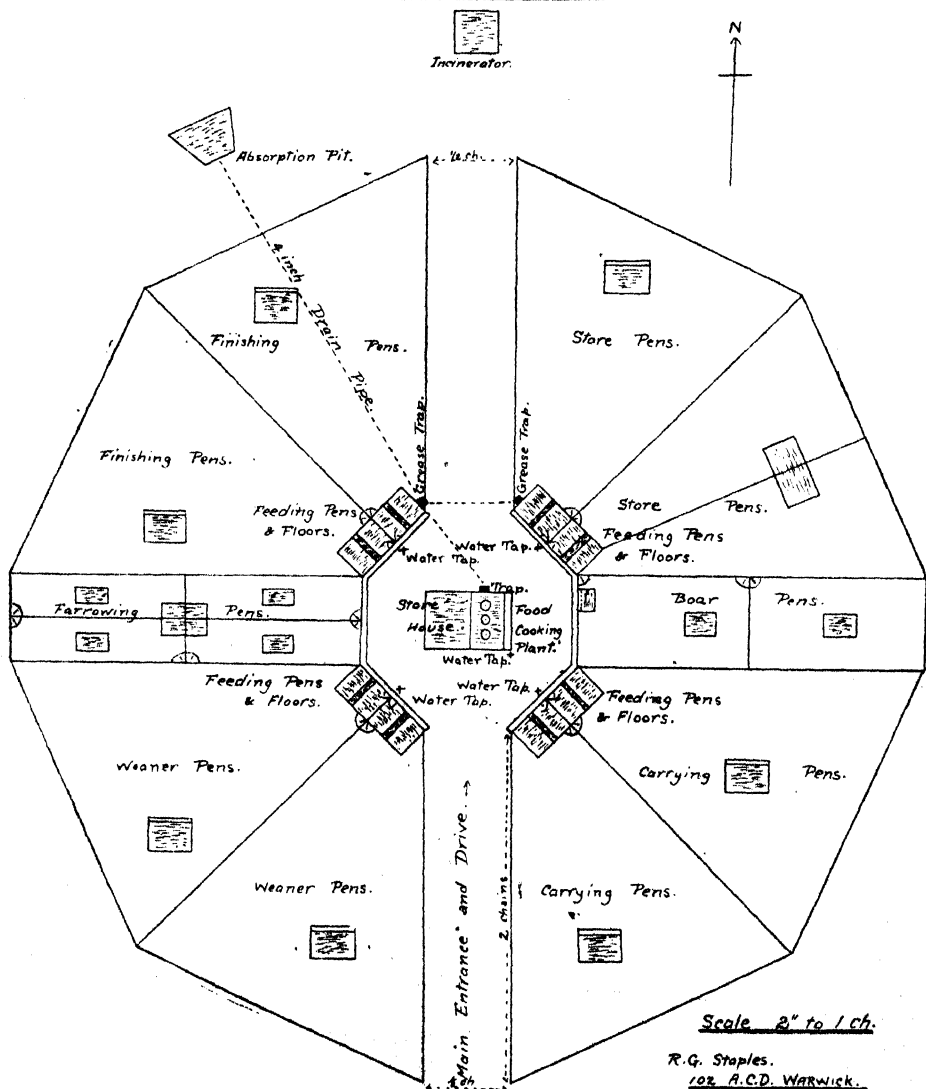
A Model Piggery Layout.

E. J. SHELTON.

FINDING that the disposal of the food scraps from a large military convalescent camp in Queensland through the usual channels was not—to the camp—a profitable venture, the Commanding Officer of 102 Aust. Con. Depot, Col. H. M. Saxby, decided to enlist the services of one of his senior officers, Major F. B. Common, in an investigation of the possibilities of the camp conducting its own pig farm.

PIGGERY LAYOUT UNIT FARM.

102 A.C.D. WARWICK.



An additional area of cultivation land being available nearby, this area was added to that then occupied and the farm now consists of 68 acres of land varying from rich lucerne flats to upland grazing areas. Fig. 1 shows the general plan adopted, inclusive of the necessary equipment for boiling refuse food scraps.

The choice of a breed fell on the Canadian-type Berkshire, popular in the district, and animals of first quality were secured as foundation breeding stock. The next move was the registration of the "Depot" Stud as members of the Australian Stud Pig Breeders' Society and entering up of the breeding stock as the camp property.

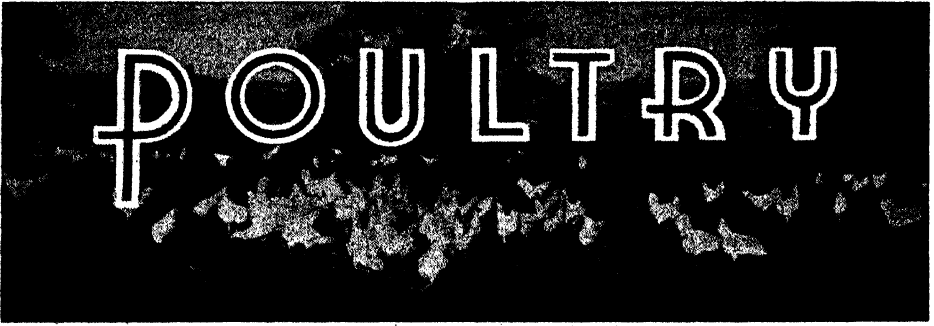
Speaking of the objectives, it is worthy of note that these include the production of quality stock and products through the provision within the camp itself of an economical and profitable market outlet for all food scrap and such farm products as could be grown—viz., lucerne, oats, root crops, &c. The aim also is to provide for soldiers convalescing at the camp an interesting and helpful—withal profitable—phase of agriculture, in this case pig raising; and the provision of practical educational and working facilities through which those who are interested may gain more than a passing insight into the many and important phases of pig production about which there is a great deal more to learn than is usually understood.

The venture is as yet in its initial stages, hence no statement regarding financial returns is available, but the fact that there has been judicious expenditure on foundation stock and equipment augurs well for the achievement of the promoter's object of making the stud a practical, profitable, and useful addition to the Depot's equipment.



SALT FOR PIGS.

Coarse salt mixed in the food given to pigs is harmful only when fed in excess. In Departmental tests to determine whether salt has any toxic (poisonous) effect increasing amounts of salt up to $2\frac{1}{2}$ ounces per day were fed to pigs without any harmful results, and the animals gained weight normally under conditions to which they had gradually become accustomed (from a few grains only per day up to $2\frac{1}{2}$ ounces per day per pig), and where they had free access to clean drinking water. If the salt had been fed in increasing amounts without continuous access to drinking water, or if the maximum amount had suddenly been added to the food in one dose, results may have been disastrous. Cases of pig poisoning due to excess of salt are rare and are invariably due to accidental causes, such as when pigs have access to salted hides or skins, or where they are compelled to eat food mixed with water carrying excess of salt (brackish water). The addition regularly, daily, of small quantities of salt to the food is recommended in preference to periodical doses excessive in quantity, or none at all. Minerals are necessary, and may be used in the form of bone meal, charcoal, wood ashes, or commercial mineral mixtures containing these and other mineral matter. All commercial stock foods carry a small percentage of salt to make them more appetising.



Incubation.

P. RUMBALL.

INCUBATION may be successfully practised throughout the year, but more satisfactory results are obtained after the moulting period, which is usually over by June. The demand for eggs to-day is so extensive and the need so great that hatching is justifiable at any time to fulfil this need.

During the hatching season of 1943 there were many reports, particularly at the commencement of the season, of poor results. These poor results were not due to the lack of fertility, but to dead-in-shell. Incorrect operation of incubators can be responsible for much of this trouble, but it is not likely to be the case with experienced operators working old and tried machines. The trouble last year was undoubtedly due in most cases to defective nutrition. The feeding of the breeding stock has a most important influence on hatching. The feeding of the breeders does not end with the hatching of the chicken. Incorrect feeding also has its effect on the rearing of the chickens.

The fodder supply position this year is no better than it was last year. There appears little or no prospect of the availability of fish oil for breeding stock, and as the bulk of the ration will consist of white grain the shortage of vitamin A must be provided for. The only source of this vitamin that appears available is green feed, choice lucerne chaff, and probably some maize. Some of each, if practicable, is advocated. All the green feed the birds will eat should be provided. If it is necessary to use lucerne only, it should be of the best possible quality, the fresher the better. If a white grain mash is fed because lucerne (or any other green feed) is unavailable, all yellow maize should be fed as grain.

Selecting Eggs for Hatching.

Care in the selection of eggs which are to produce the future layers and breeding stock is essential. They should be selected for size, shape, texture of shell, and colour.

Although like does not produce like with any degree of certainty, constant selection generation after generation will tend to fix the qualities desired. Size is undoubtedly an inherited quality, and one of the factors which have an important bearing on profitable poultry raising. Birds should be selected for breeding purposes for egg size early in life for it is only by this means that a strain that will lay early in their pullet year eggs that may be graded for size as first quality can be developed. Eggs vary in size from day to day. This variation

may exceed a quarter of an ounce in the course of the sequence of production. Therefore, in selecting for size, it is not just enough to note whether a bird lays a 2-ounce egg on one day, but to observe the size of egg she lays on consecutive days of each sequence for, say, a month. As in breeding there is a tendency for reversion, it is better to select hens for breeding purposes which lay eggs averaging 26 ounces to the dozen than those averaging barely 24 ounces to the dozen.

Although shape does not materially affect the market value of eggs, a uniformity is desirable. Some eggs may be short and thick in shape, others too long. The happy medium fits egg containers much better and is marketed with less damage. Misshapen eggs are invariably poor hatchers, and therefore should be rejected. In table type incubators, the heat is radiated from above the eggs—the greater the distance from the source of heat the lower the temperature. In some table top machines, the difference between the temperatures one inch above and one inch below the egg tray may be as much as six degrees. As the embryo always moves to the uppermost portion of the egg, eggs of various sizes lying on the egg tray are therefore subjected to varying degrees of temperature with a consequent uneven hatching.

Texture of shell varies considerably with feeding and the general condition of the stock. Young birds produce invariably shells of better texture than older birds. Inheritance also influences shell quality, and as the true breeding qualities can only be judged in the older birds, shell texture is an important factor in the selection of eggs for incubation. Apart from this, uniform shell structure makes for improved hatches. Colour of shell is not so important from a hatching point of view, nor does it have any influence on the ultimate value of the egg. Shell colour is a breed characteristic. From light breeds, excepting Dutch breeds, the shell should be white; from heavy breeds selection should be from brown shells. Dark brown shelled eggs are pleasing to the eye, and, although the shell is only the container, selection from dark shelled eggs is usual.

Keeping Eggs for Hatching.

The earlier eggs are set after being laid the better the results. If they are no older than five days, better results would follow than if they were ten days old. It is, however, necessary at times to keep them for longer than five days, and to obtain satisfactory results they should be retained or stored under conditions which will preserve their hatching qualities.

Fertilization of the egg occurs in the oviduct of the hen. Cell division then commences and if the egg were submitted to a constant suitable temperature there would be no arresting of cell division or growth of the embryo. After the egg is laid and becomes cold, cell division is arrested; and it is at this stage that it should be maintained. From experiments it has been found that a temperature slightly under 60 degrees is about the best temperature at which to hold eggs pending incubation, and that germ development becomes active at a temperature of 68 degrees. As before-mentioned, the embryo always comes to the uppermost side of the egg. If the egg is to be held for any considerable time, there is a risk of the embryo sticking to the membrane lining the shell of the egg; to avoid this, the egg should be turned.

Eggs held for incubation should be stored in a room at a temperature not exceeding 60 degrees. The air in the room should be fresh,

sweet, and still. A current of air through the room would cause rapid drying of the moisture content of the eggs.

A good plan is to store eggs in cases fitted with fillers. This protects the eggs to some extent from drying out and facilitates the daily turning of eggs which have to be retained for any length of time, as all that is necessary to turn the eggs is to lay the case every alternate day on a different side.

Period of Incubation.

The period of incubation varies considerably with different species of poultry. The hen takes 21 days. All domestic ducks, excepting the Muscovy, 28 days; the Muscovy, 34 to 35 days; the goose 28 to 30 days; and the turkey, 30 days.

Hen Hatching.

A broody hen will generally find her own nest. She may be left alone, merely protecting her from the weather and preventing other hens from laying in the same nest. At times it may be necessary, because of lack of facilities, to shift her, but this should not be attempted for a few days, and then only at night, for she is less excitable, and more likely to settle down to new quarters. On shifting put one or two of any kind of eggs or artificial eggs under her, until her willingness to use the nest is established. When this is determined the eggs it is desired to hatch may then be placed under her.

Most poultry houses are fitted with wooden nests raised a foot or more about ground level. However desirable otherwise, such a raised nest is not the best type for the broody hen. For a broody hen, a nest should be on the ground and obviously in a dry place protected from drainage and the run of rain water. The nest should consist of a slight hollow in the soil lined with clean straw, or dry grass. Mouldy material should not be used. As the hen is expected to remain on the nest for 3 weeks, leaving it only for feed and water, she will not make free use of a dust bath, consequently body vermin, if present, is likely to multiply. To guard against this, she should be given a dusting with some insect powder before the clutch is placed under her, and another dusting a few days before hatching is due.

Red mite and tropical mite are possibly the most common and irritating blood sucking parasites that trouble poultry. They multiply very rapidly when unchecked, and a sharp lookout should be kept for their presence for, if allowed to infest a broody hen, they frequently cause her to leave her nest. Scaly leg is also a condition to be prevented, especially with a broody hen. The scale is caused by a parasite which may attack the chicken's legs as soon as they are hatched. Not only is scaly leg unsightly, but the parasite is obviously detrimental to the proper development of the young birds. The only protection of the young from scaly leg is to avoid using broody hens affected with the trouble.

The number of eggs that should be set under a hen depends on the size of the hen, which should never have more than she can comfortably cover. A hen turns the eggs she sets upon to prevent the embryo sticking to the membrane lining the shell. She also alters in the nest the position of the eggs. Those on the outside one day may a few days later be in the centre, and the centre eggs on the outside. If a hen is given too many eggs, the outside eggs may not get enough warmth, and in cold weather they may become chilled, and the embryo destroyed.

The constant movement of the eggs may therefore result in the destruction of most of the clutch. Therefore, it is better to give a hen too few than too many.

While a hen is setting she should be fed exclusively on grain and have access to grit and water at all times. She should not be removed from the nest at any time during the incubation period. She will come off when necessary, and if she is going to make good on the job go back to her nest before the eggs get too cold.

EFFECT OF CLIMATE ON DIFFERENT CLASSES OF POULTRY.

Two classes of birds are generally used by commercial poultry farmers—light breeds, such as Leghorns, Anconas and Minorcas; and heavy or dual-purpose breeds, such as Australorps, Wyandottes, and Rhode Island Reds.

Light breeds, as a rule, are of a "highly strung" nature, and are very susceptible to climatic changes, particularly during the early periods of production. Rains and cold snaps will invariably check production with this type of bird. This is particularly noticeable if the birds are not housed under the intensive system. If false moults are to be avoided, the highly strung nature of the birds also makes it inadvisable to alter their location until they have settled well into production and until spring approaches. If, for any reason, light breeds have to be handled before, say, the middle of July, go about the work quietly and, if at all possible, work only in the afternoon, for most of the birds to lay on that day will have done so by then.

The dual-purpose breeds, on the other hand, are more docile and quiet. They are not so easily disturbed by climatic changes during the early laying stages, but are more susceptible to heat, as many dual-purpose birds lay on fat. Greater liberties can be taken with dual-purpose breeds in relation to change of quarters, but do not worry them or shift them during early winter, as they are not immune from false moults.

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ANIMAL HEALTH

Tick Fever of Poultry.

TICK fever* is a highly fatal disease of poultry, ducks and geese, caused by a microscopic spiral-shaped organism called a spirochaete. The disease has been reported from nearly all over Queensland, its distribution following closely that of the poultry tick which is the chief factor in spreading the disease. Although an important disease of commercial flocks in earlier years, outbreaks are now confined mainly to backyard and farm flocks where no precautions are taken to control ticks.

Transmission.—The disease is not contagious in the ordinary way, but is dependent on blood sucking parasites, such as ticks and mites, for its spread from bird to bird. Ticks are the most important means of transmission because of their wide distribution, difficulty in eradication, and also because the organisms can multiply in the body of the tick which may harbour them for several months.

Symptoms.—In very severe outbreaks, deaths may occur before symptoms show. Generally, however, the affected birds are dull and stand or sit with closed eyes, ruffled feathers, and the head held low or drawn into the body. The skin and comb may be dark and withered, or sometimes pale. A high fever, the temperature rising to 110 deg. to 112 deg, greenish-yellow diarrhoea, leg weakness and later paralysis are characteristic of this disease.

Post-mortem Appearance.—The most constant and typical finding after death is a greatly enlarged spleen. Normally the size of a hazel nut, this organ may be swollen to the size of a peach and is flecked with greyish spots. The liver is usually congested and may show flecking similar to that of the spleen. In some cases, the tissues, particularly of the liver, have a yellowish or jaundiced appearance caused by the breaking down of the red blood cells by the spirochaetes.

Mortality.—Up to 80 per cent. mortality may occur, heaviest losses being found among young birds which appear to suffer more severely than old ones. Deaths usually continue over a period of two to three weeks, after which the remaining birds develop a strong resistance to further infection. After recovery, a few birds may become anaemic, waste away, and eventually die.

Diagnosis.—When a number of birds die after showing the symptoms described, it is advisable to take the temperatures of a few sick ones to determine whether fever is present. Blood smears should then be taken from two or three of those with the highest temperatures and sent to the Animal Health Station, Yeerongpilly, for examination. The organism may be found by microscopic examination of suitably stained blood smears, thus confirming the diagnosis.

* *Spirochaetosis.*

Smears are prepared by cutting a spike of the comb with scissors or pricking a vein beneath a wing with a needle and smearing a small drop of blood on to a glass slide (any piece of flat glass about 1 by 3 inches is suitable). The smear is allowed to dry, the slide wrapped in paper, packed in a small tobacco tin, and sent to the laboratory with a covering letter giving details of the sickness. As an alternative, a live bird showing typical symptoms may be sent for examination, but care should be taken to select a bird which is expected to live until arrival, as birds dead for more than a few hours are unsuitable.

Treatment and Control.—Tick fever can be treated successfully with organic arsenical compounds—e.g., mapharsan—but the cost of these drugs is rather high and they require careful injection hypodermically into the muscles, thus precluding their general use. The disease can be controlled effectively, however, by eradicating the carrier parasites. To do this, it is necessary to have some knowledge of the life cycle and habits of the parasites which carry the disease, and the following outline of their life is therefore given:—

The Poultry Tick.

Adult ticks feed only at night and shelter during the day in cracks and crevices in the woodwork of poultry houses, under litter and rubbish, or even in the bark of trees. Thus an examination of the fowls during the day may not reveal ticks, even though they may be present in great numbers.

The adult female tick deposits its eggs in a sheltered position and may lay up to 900 in several batches during its lifetime. Under favourable conditions, the eggs hatch in ten to fifteen days, and the small larval ticks which emerge have only six legs. They attach to the host and can be seen as bluish specks about the size of a pin's head clinging to the breast, neck, and wings and thighs. In three to nineteen days they leave the fowl, seek a sheltered spot and moult, appearing again as an eight-legged nymph, which, like the adult, feeds only at night. After two further moults, the adult stage is reached.

Control.—Fowl ticks are difficult to control because they resist ordinary insecticides and their habit of sheltering in deep cracks makes effective application of sprays uncertain. Moreover, the mature ticks are able to live for at least four years in an empty fowlhouse, so that vacating the pens in an attempt to starve out the pest is not practicable.

The most suitable sprays are crude oil, creosote or kerosene emulsion. The latter is cheap and kerosene is available in most households. To prepare it, boil 1 lb. of soft soap in 1 gallon rain water until dissolved. Remove from the fire and stir in 1 gallon of kerosene. This stock is then diluted with 8 gallons of rain water before use.

Before spraying, all nesting straw and litter in which ticks might hide should be removed and burnt. The spray should be applied hot and forced well into cracks and crevices. Treatment should be repeated at three-weekly intervals until no more ticks are seen, and thereafter every three months.

Perches should be turned over and, with nest boxes, treated at each spraying. To prevent the eggs developing foreign flavours, new nests should be provided until the odour of the spraying material is no longer present.

It is very difficult to get the ticks out of old houses and, perhaps, the most effective way is to burn the building and erect a new one on a fresh site.

Fowl houses built of **sawn timber** and **iron** have the **advantage** of providing fewer hiding places for parasites, besides being easier to spray effectively.

When the poultry are moved to new quarters, they should first be treated with carbolised vaseline about the neck and breast after examining them for larval ticks, or dipped in solutions of 2 per cent. formalin or nicotine sulphate, or dusted with derris powder.

Special coops should be kept for introduced stock which should be isolated for at least twenty-four days before being placed with the other birds. These coops should be sprayed regularly.

Red Mite.—This mite is much smaller than the tick, being about the size of a pin's head, but like the tick feeds only at night. It is seldom found on birds during the day, except perhaps on broody hens. It lays its eggs in crevices in which it hides and the life cycle requires one to two weeks. The adult can live several months away from the host.

Control methods as applied for ticks give very good results, as this parasite is not so difficult to control.

CARE OF THE CATTLE DIP.

In the course of time a dipping vat will accumulate a considerable quantity of filth, which settles slowly on to the bottom as a deposit of sludge. It may become so bad that an owner is forced to empty the vat and is then put to the expense of recharging.

This can be avoided by cleaning the vat periodically. For this purpose, a kerosene tin is cut in half diagonally to make a scoop, which is attached to a handle with wire. Small holes are cut in the bottom and sides. After dipping cattle, the surface of the fluid may be skimmed with the scoop and floating hair and dirt removed. This helps to keep the vat clean for a long time. After dipping the sump should also be cleaned and dirt prevented from accumulating.

A white mark should be placed on the side of the vat to show the height of the fluid. It will be noticed, particularly in hot weather, that evaporation is very rapid and that the surface of the fluid will fall far below this mark. Before next dipping, water may be added until the dipping fluid is again at the correct level. It is only the water that evaporates—not the concentrates.

CHAFF IN THE EYE.

For horses to get chaff in their eyes is a common experience. To try to remove the chaff by blowing sugar into the horse's eye is both cruel and risky. Castor oil (as used as a medicine) is much better. All that is necessary is to place the oil in the horse's eye night and morning until the condition is remedied. The horse may continue to be worked under this treatment. A bottle of castor oil should always be kept in a handy place.

FARM ECONOMICS

Farm Management.

C. H. DEFRIES, Instructor in Agriculture.

ON the average farm the farmer himself performs all or most of the functions of organiser, works manager, supervisor, worker, office manager and salesman. In a factory of any size these functions are allotted to different men according to their special abilities. The consequences of the absence of specialisation are that farming becomes not only a more complex job than many others and that the farmer himself tends to think of his variety of tasks as just "farming." The special problems of each of the functions he has to perform in some measure or other are not kept to the forefront as they are in a factory, where the existence of several departments give rise to its own problem of co-ordination of effort. The problem on the farm is rather that of the recognition of the several phases of farming, so that they are in fact recognised as quite distinct functions. This applies particularly to the function of management.

Farm Management.

Successful farming depends on many diverse factors, not the least of which is the capacity of the farmer himself; but no matter how capably a farm is run, attention to the fundamentals of management would be conducive to even more satisfactory results. The two requirements of management on a farm are, first, the construction of a system of records, and, second, the capacity to interpret the meaning of the information derived from the records and to use it in running the farm.

The records kept on the typical family farm are usually not very comprehensive, even if they exist at all, and many farmers in fact do no more than retain cheque butts, dockets, accounts, and account sales; that is, the barest minimum required for the purpose of making out income tax returns. Most men on the land are inclined by the very nature of their calling to keep to the minimum the amount of time they spend on clerical work, unless there is some immediately obvious reason why they should do otherwise. This attitude is easily understood, especially at the present time, when the most pressing problem on many farms is that of finding enough labour and time for the ordinary daily routine. It is none the less a mistaken attitude. While it may seem paradoxical to urge action requiring some, if only a little, of a farmer's time during a period of labour and other shortages, it is for this very reason that records assume an importance greater than they would have in normal times. Under our present conditions, it is imperative that the most effective use possible be made of the labour, machinery, and other available resources, and records giving information as to the labour hours, machine hours, tractor hours, and so on required for various farm operations and crops could make a very real contribution to this end.

The Value of a Farm Record System.

The keeping of records does not imply the use of the double entry system of bookkeeping. This has a place on the larger farms, plantations, or stations where it is economical to employ an accountant or bookkeeper, but for the average farmer its value does not warrant the time and trouble necessary for the system to be properly followed through. Usually it is too elaborate for the special needs of the farmer unless it is supervised and done by accountants, perhaps on a farm co-operative basis. Until some such procedure is elaborated—and it has been done quite successfully in other countries—it is the farmer who has to keep his own records and the problem confronting him is precisely what is the minimum of records which should be preserved in order to provide information useful for planning the farm operations. To reduce the work as much as possible, it is suggested that—apart from special types of records, such as milk testing data, milk or egg laying records—there are two types of records which should be kept by every farmer, even if he has no assistance from any organisation and has to rely on his own unaided efforts. They are the farm diary, with which this article is chiefly concerned, and the farm inventory, which is, of course, a list of the farm assets and their value.

The Farm Diary.

A very useful type of farm diary book is one with one day to the page and with two sets of £ s. d. columns on the right-hand side. These may, of course, be ruled by the farmer himself if necessary on a foolscap-size diary. The most troublesome difficulty will be to know what to include and what to omit. If an attempt is made to overload the book with too much detail, it becomes too difficult to analyse and is therefore useless. If more elaborate records are required, a diary is only a useful supplement to them; but, notwithstanding the fact that optimum value from recording farm data would doubtless require more complete records, reference at present is being made only to the minimum of records which it is desirable should be kept on every farm.

Broadly speaking, two courses are available. One is to keep a general record which would provide a fairly complete picture of the financial transactions of the year and the work done on the farm in a readily available form. This is particularly useful where there is one major enterprise on the property, e.g., dairying or wheat-growing, but if the system is more diversified it is perhaps desirable to have some means of keeping the records relating to each section of the farm distinct, even if only to assist in their interpretation, otherwise the diary becomes too cumbersome. In some cases this could of course be accomplished by dividing each page into three parts, one for general records and the other two for two main sections of the farm.

Another alternative is to crystallise the recorded data around one or two of the most prominent problems which confront the farmer on his particular farm. Such problems exist on any property. They may be peculiar to the individual, common to the district in which he is farming, or even to the industry in which he is engaged. Whether it pays to have work done by contract, the advantages of horses and tractor, the continued production of a crop or a sideline which seems to be on the margin of profit, the requirements of new crops as regards labour, materials, and machinery, or suggested new methods of handling crops, are all matters in regard to which it would be advantageous to keep records which would assist judgment.

To return to the general information which might be entered in the farm diary, the following matters are well worth inclusion:—

1. Weather data, such as daily rainfall, excessive high or low temperatures, the first and last frosts of the season, and notes indicating the number of days in the year on which the soil was unworkable, would be of great value to the crop farmer.

2. The receipts and expenses of the farm. All cash payments to be entered on the day on which they are made, and similarly with receipts.

3. A note of the date of consignment of produce and of the farm purchases.

4. The details of the type of work done during the day and the implements used.

5. Any special information that might be of future interest, such as the incidence of disease among stock, deaths, and the occurrence of pest and disease in crops.

6. The quantity of seed and fertilizer used on crops.

The Use of the Farm Diary.

Nothing has been said so far about costs of production. Far more data is required for this than is provided for in a simple diary, although it is possible by comparing the total receipts with total expenditure to find out the financial structure of the farm as a whole, provided an inventory is made up at the conclusion of the year. The major uses of the diary can be summed up as follows:—

1. It gives a summary of weather conditions through the years that could be of value when planning the optimum use of labour and machinery, particularly if information such as the number of days in the course of the year in which it is usually impossible to use implements is included.

2. The amount of time spent on work of an overhead nature can be compared more accurately with that spent on actual production. For instance, the buildings may need repair, fences have to be erected or repaired, machinery overhauled or repaired, or some time spent on the actual transaction of business. Very few farmers know just what time is occupied in this sort of work compared with time spent on actual production operations, ploughing, and so on.

3. If regular records are kept of costs and time in use, decisions as to whether a new tractor or implement should be bought are more accurately made and, at a time like the present, when it is necessary to bring forth cogent arguments to obtain tractors and engines, information of this nature would be helpful both to the farmer and to the authorities.

4. A record is kept of any special outlay on feed for stock, the price received for farm produce, the dates when operations were commenced and concluded, the dates of sowing crops, and matters of interest not only for the year in which the diary is kept, but also for future reference.

5. It provides a record of receipts and expenses from which it is possible to find out the financial position of the farm as a whole, and the amount left to provide for depreciation, interest, and the farmer's net income.

Obviously, as mentioned previously, the value of these records is limited, and if it is desired to have a fairly complete analysis of the farm business then far more time and trouble is involved than visualised here. None the less, permanent records are so rare on farms that it

seems worth while to urge even the simplest of recording systems in the hope that once their value is realised there will be more inclination toward the more elaborate types of records, at least on some farms.

In farming, more than in any other business, no matter how complete the records are there is always something which will crop up and upset the most valid of judgments. It is this fact that so often prevents a farmer from paying any attention to this type of work, but it is none the less true that the good farmer is the one who can profit most by experience, and he is on surer ground when thinking about his experience if he has it recorded in permanent form so that the facts can be referred to and verified.

It has been suggested that rather than keep general records, a farmer might prefer to concentrate his attention on one particular phase of his farming. This attitude is, in fact, fairly common, although it is thought that some general records should always be kept in diary form.

However, illustrations of some of the more commonly encountered problems in the solution of which farm records could be used may be useful.

(1) **Contract work.**

One question that is arising now, and certainly will do so to an even greater extent in future years, is whether it is more economical to have some types of farm work done by contract or to have the necessary plant permanently on the farm. The future will see a considerable extension either of contract work or of co-operative use of large plant, and in many cases the advantages of one or the other will be clear. Just as at present such a course is obviously desirable because of shortage of labour and machinery, it will be one means at least by which the smaller farmer can rid himself of the curse of over-capitalisation. Even so, it may be quite useful to know just how obvious the advantage is if only to convince those who do not agree. This can only be accomplished by figures which would show the actual hours the owned plant is in use, together with the expenses incurred in using it, and this would permit each farmer to compare the cost of the contract job and his own expenses, including, of course, depreciation and interest on investment. There is always some advantage in owning plant—cultivation machinery or harvesting machinery, for example, can then be used just when it is most appropriately required—but where a farmer is likely to be confronted with this problem in the future, the only sound basis on which to make up his mind on the matter is to know the difference in cost between the two methods. If it is great enough it will outweigh the superiority of ownership; if not, then other considerations might come into operation. The main thing is to know not that one is cheaper or dearer than the other, but to what extent.

Information necessary for this purpose may be entered into a diary, or two simple record sheets might be used; one to show the expenses incurred in performing the work on the farm during the year and the other to show the dates on which the machinery is used and the time during which it is used. The cost of operation per hour or per acre can then be calculated without much difficulty.

(2) **Semi-Permanent Assets.**

Another type of problem inevitable during a time of labour shortage is the need to decide between the use of available resources for the maintenance of semi-permanent assets, and their use for the production of annual crops. This is of particular concern to an orchardist, who

has a semi-permanent asset in the form of fruit trees which, while they may continue to bear, will none the less deteriorate rapidly unless adequate attention—such as spraying and cultural operations—is given them. However, it may be desired to divert some of the labour and machinery of the orchard to the production of vegetables and, while the immediate gains may be attractive, if they are obtained at the cost of the deterioration of the orchard their ultimate value is problematical. Data which would show what labour hours and other resources are necessary for the normal maintenance of the fruit trees would, in such circumstances, be of great value, and would help to avoid mistakes of this nature which have, to the writer's knowledge, been made. Even if little is known about the requirements of the vegetable crop grown, records kept for the first season would be some guide as to the extent to which it is safe to commit the available labour, &c., to crop production, rather than maintenance work. The converse of this reasoning is also worth mentioning. From fear of allowing deterioration in the orchard, there may be a disinclination to grow other crops in the absence of information which would provide a basis on which to judge how the resources of the farm should be apportioned. This, again, will result in financial loss.

(3) **New Crops.**

Arguments similar to those outlined apply to the farmer who is engaged on the production of crops new to his farm and perhaps to the district. Records of labour, machinery, and materials used cannot fail to assist in deciding whether to expand production of the new enterprise at the expense of the normal cropping system. This is particularly relevant to such crops as vegetables which are being grown for the first time on many farms. It is just as easy to miss opportunities for profitable production as to attempt too much and find that some part of the programme has to be neglected. Seasons differ certainly and the results of one will not be duplicated exactly in the next, but the amount of work needed to keep the required information is so small that, rough guide though it is, the balance of advantage definitely rests with a system of records.

(4) **Doubtful Enterprises.**

On many farms, especially if production is diversified, there may be one particular enterprise or crop which is, or appears to be, either a loss or on the margin between profit and loss. In such a case, it might be useful to concentrate attention on this particular crop for a season and keep as complete a record as possible of all the relevant particulars in connection with it as a means of providing a basis for judgment. Thus a particular point would be made of entering in the diary all of the expenses incurred in the enterprise, together with the time spent on it. As this does not provide for the apportionment of overhead charges or joint costs, the aim is not to arrive at the ultimate cost of production so much as to obtain a rough guide to the possibility of replacing one enterprise by another which can be fitted into the farm system. It is sufficient for this purpose to regard the farm overhead as fixed.

The essential feature in which the type of record outlined is of value to the farmer is that instead of relying solely on general impressions, he has some factual data which can be used as a criterion between one course of action and another. The information he obtains in this way is not a substitute for judgment, but is a guide which is far too often neglected, and while in farming blue prints of the future may not be practicable, a few minutes spent each day on keeping track of essential information will prevent many errors and avoid much waste and inefficiency.

Knots to Know

WATER BOWLINE.

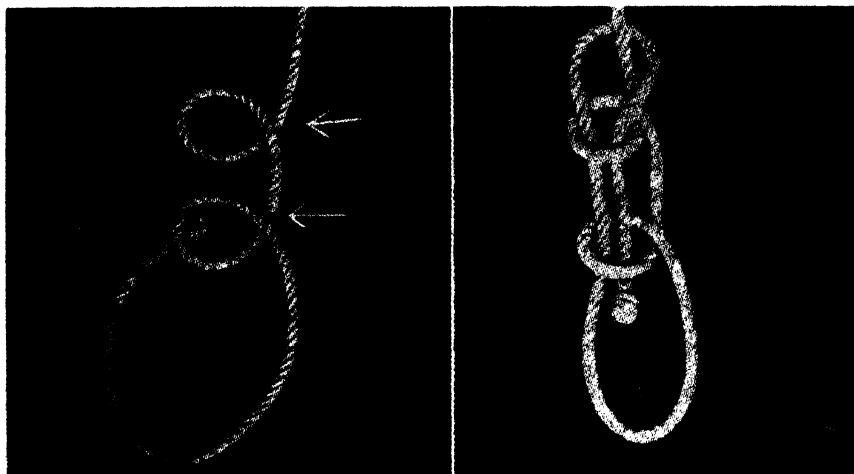


Plate 114.

Left—WATER BOWLINE.—Showing method of tying. Right—Completed knot.

This knot is perfectly secure and will not slip under any conditions. It consists merely of a loop with a bowline below, and is made with two loops (see Plate 114), one above and one below, the short end being threaded through as in a bowline. The great advantage of this knot lies in the ease with which it can be undone when wet. This makes it particularly suitable for use under water.

BOWLINE ON A BIGHT.

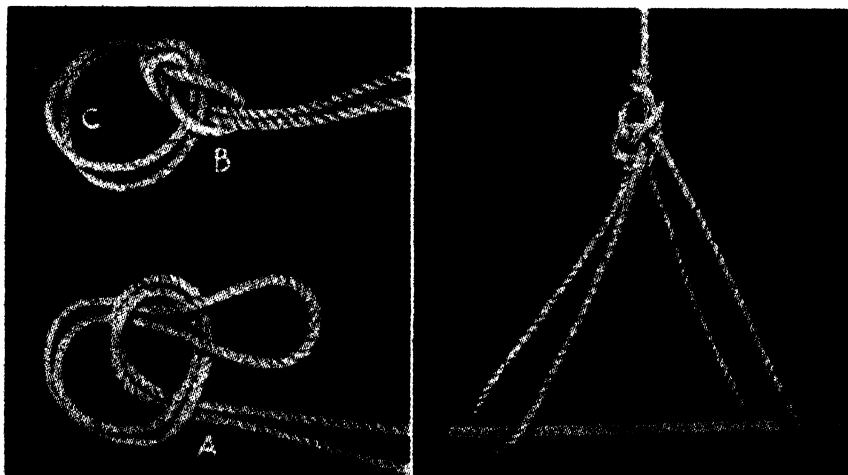


Plate 115.

Left—BOWLINE ON A BIGHT: Fig. A—Method of tying; Fig. B—Completed knot. Right—Bosun's chair ready for use.

Bowline on a Bight (Bosun's Chair).—This knot is sometimes used as a working cradle by painters, and is also used as the foundation knot in arranging a rope harness for throwing horses.

It can be made quite simply by first making an overhand knot as in Plate 115 (Fig. A), and then pulling the ends through the loops as in Fig. B.

If the double rope loop "C" is then spread out to form two single rope loops, it can be used as the bosun's chair (see Plate 115, right).

The bosun's chair can be easily made by doubling the rope and making an ordinary bowline knot.

Used for throwing horses, the double loop is passed over the horse's neck to rest on the shoulders, and the two single ends are led off between the front legs, round the hind feet, and back through at the shoulder. When the ends are pulled the animal is brought gently to the ground, and the hind legs are then held by hitching them with the ropes.

HAY KNOT.

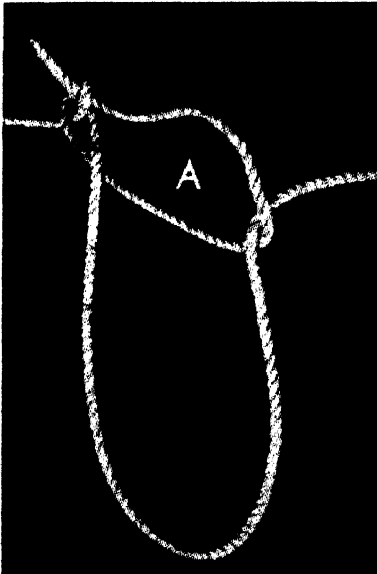


Plate 116.
HAY KNOT.

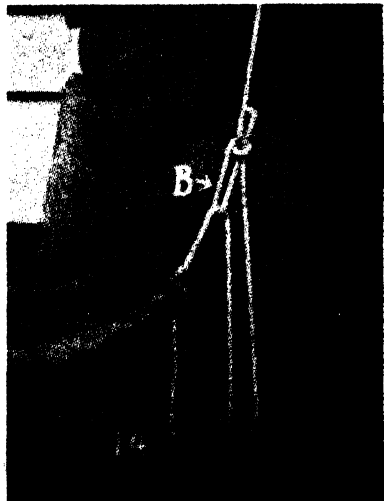


Plate 117.
HAY KNOT IN USE.

This knot will be found extremely useful for lashing a load on a wagon, and for those engaged in carrying work it is indeed indispensable, as it can be used for roping round a load or over it with equal facility. Its use gives a mechanical advantage of nearly two to one, and the strain can be easily held while the finishing hitch is made secure.

To make the knot reach up with the left hand and make a single loop at a suitable height (Fig. A). Then with the right hand double the slack of the rope into a loop, and pass this through loop (Fig. A) as shown in Plate 116. Still holding an easy strain, the free end of the rope is led round a ring bolt in the wagon and back through the loop (Plate 117, Fig. B), which acts as a pulley and provides a purchase for tightening up the load. The knot is secured by a hitch. While this knot will never slip in normal use, it can be made proof against accident by a half hitch of the upper loop round the rope. This prevents any risk of the upper loop being inadvertently pushed through the hitch.

GADGETS AND WRINKLES

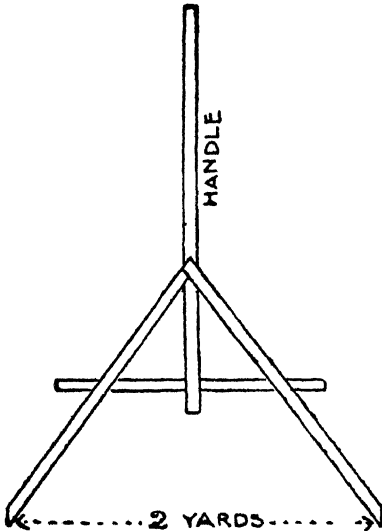


Plate 118.

RAPID LAND MEASURE.

A speedy and accurate land measure is illustrated in the adjoining sketch. To use it, catch hold of the handle with both hands, and turn the measure round and round, keeping one leg on the ground each time. Measuring may be done as fast as a man can walk. The contrivance is particularly useful for marking out lands for ploughing. A good strong light one can be made from slats from binder canvases.

A SIMPLE BIRD SCARE.

Here is a simple and efficient bird scare: It consists of an ordinary post with an arm fastened to it at a right angle. From the arm, suspended on wire are bright tin shingles or other strips of bright metal. When the sun is shining or the wind blowing, the glitter and rattle of the suspended tin plates will scare birds away from the growing crop.

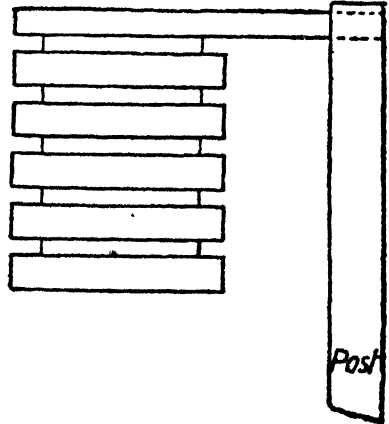
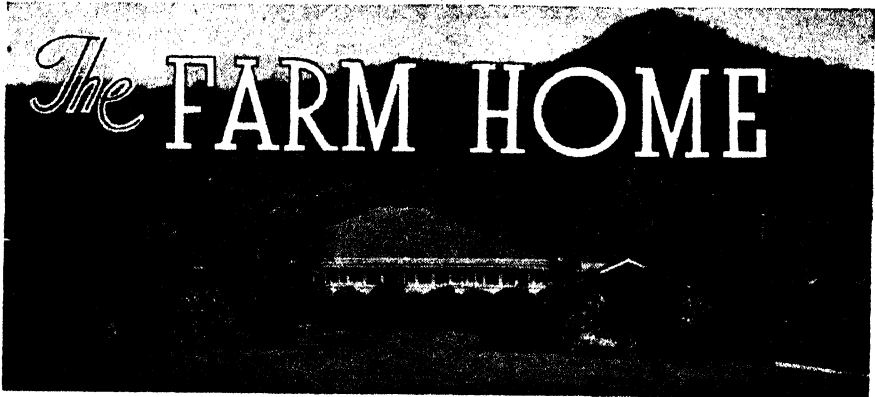


Plate 119.

Care of Tools.

Many hand tools are not now being made. Some are being made of lower grade steel, for example, than before the war. Files are in the latter category, but are difficult to obtain. Therefore, care in handling and storing is essential. The division of agricultural engineering, Univ. of California, suggests that files be kept clean of filings, brass, and particularly of wood particles because the latter will draw moisture and cause rust. A few minutes boiling in water will loosen the wood particles, but metal must be scraped out. Store files separately; don't just throw them into the tool box. Never drag a file on the return stroke. Have the surface clean. Use a worn-out file and extra elbow grease for the first work on hard surfaces, saving the sharp file for the major job.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

CHECKING THE DEVELOPMENT OF YOUR TODDLERS.

HOW often do parents say "Prevention is better than cure" and how rarely do they think seriously of what an important part prevention should play in the life of every child.

Doctors have always proclaimed the value of a medical check up at regular intervals for adults, but how much more important is it to maintain a regular medical check of the development of the child of pre-school age—the toddler.

Let us see how this can help in maintaining a toddler in good health. A few days ago a four-year-old child was brought to a suburban health centre with ten of his twenty teeth badly decayed, including all the molars or grinding teeth. Half of the children examined for the first time at this centre have had defective teeth, some so far decayed that they require extraction. This is a tragic state of affairs because loss of the first teeth limits the child's ability to chew his food properly, as well as causing a narrowing of the jaws. Unless the jaws are broad and well developed there will not be enough room for the second teeth to come through and the child will be condemned for life to a spoilt appearance due to protruding or overcrowded teeth, in addition to a spoilt digestion and general ill-health from badly-chewed food and the absorption of poisonous matter from the decayed teeth. Had the doctor in attendance at the Centre been seeing this child at regular intervals, the mother would have been advised long before as to preventive treatment which would have made a great difference to the child's health. What is true of the value of regular inspection in the case of the teeth is equally true in the case of unhealthy conditions of throat and nose, faulty muscular development and posture, small defects of feet and legs, eye defects, and so on. In their early stages those small troubles are amenable to fairly simple treatment, but if allowed to progress they may become permanent or the correction may require surgical treatment on a much more extensive scale.

The Maternal and Child Welfare Centres are intended to deal with the care of the child's health from the time his mother leaves the midwifery hospital with him to the time he goes to school and comes under the care of the School Health Services. Sisters at the Centres will arrange for the toddler to have that very necessary routine medical examination every six months where this is not being done by the parent's own doctor. Height, weight, and diet will be checked; teeth, nose, eyes and throat examined. The children will learn to be proud of being healthy and strong and growing taller and heavier as well as of having good sound teeth. If any defect shows up contact with the doctor or hospital will be made and appropriate treatment arranged for. Toddlers' health centres are not for sick children—they are to help you keep well children well.

Questions on this or any other matter concerning Maternal and Child Welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

In present circumstances, recommendations are subject, of course, to the availability of the ingredients mentioned or of suitable substitutes.

Mulligatawny Soup.

Take 1 quart stock, 1 oz. butter, 2 teaspoonfuls curry-powder, 1 tablespoonful flour, 1 turnip, $\frac{1}{2}$ teaspoonful curry-paste. 1 oz. ham, 1 onion, lemon juice to taste, 1 apple, 1 small carrot.

Peel and cut the onion into rings. Dice ham. Heat the butter in a saucepan. Add onion and ham and fry until brown. Add peeled, sliced apple, scraped, sliced carrot, and diced, peeled turnip. Stir in curry-powder, curry-paste, and stock. Cover. Bring to the boil and simmer very gently for one hour. Rub through a sieve. Thicken with a tablespoonful of flour, mixed until smooth with a little cold water, and stirred very gradually into the soup. Bring to the boil, boil for a few minutes, then serve at once.

Pumpkin Soup.

Take 2 lb. pumpkin, $\frac{1}{2}$ head celery, 1 leek, 2 oz. butter, 1 cupful milk, 1 quart stock, salt, pepper and a little grated nutmeg.

Cut up the leek, pumpkin, and celery, and put them in the boiling stock. Simmer for one hour and rub through a very fine sieve. Re-heat and add milk, salt, pepper, and nutmeg to taste. Put in the butter and serve.

Ragout of Mutton.

Take 1 lb. neck mutton, 1 tablespoonful pearl barley, 1 oz. butter, 1 tablespoonful flour, 1 onion, 1 carrot, sprig of mint, piece celery.

Cut the mutton into neat pieces. Season the flour with salt and pepper, and dip in the meat. Melt the butter in a pan and fry the meat. Cut the vegetables into dice. Put the meat and vegetables in a casserole with the pearl barley. Add a pint of water and cook in the oven for about one and a-half hours.

Kidney Fritters.

Take 3 sheep's kidneys, $\frac{1}{2}$ lb. flour, 1 egg, 2 tablespoonfuls milk, salt, deep frying fat.

Boil the kidneys for a quarter of an hour. When cold cut in half lengthways. To make the batter put the flour into a basin with a pinch of salt. Mix the well-beaten egg with the milk and pour slowly into the flour, stirring all the time, until a smooth batter is formed. Dip the halves of kidney in the batter, and when well covered fry in the boiling fat until a golden brown.

Grilled Sausages and Cabbage.

Take $\frac{1}{2}$ lb. beef sausages, 1 small cabbage, 1 onion, a little butter, seasoning.

Parboil the cabbage, after it has been well washed. Drain thoroughly. Melt the butter in a casserole and add chopped onion. Cut up the cabbage and cook for half an hour. Grill the sausages, putting these on top, and mix in a small piece of butter. Put on the lid, heat thoroughly in the oven, and serve with mashed potatoes.

Sausage Meat and Potato Cakes.

Take $\frac{1}{2}$ lb. sausages (beef), 1 lb. potatoes, 2 oz. butter, $\frac{1}{2}$ gill milk, flour, stock, seasoning, parsley.

Skin the sausages (this can be easily done by putting them in cold water for a minute or two) and shape into small rolls with flour. Cook in a little stock for twenty minutes. When cold cut into slices and cover each slice with potato that has been mashed with a little butter and milk and seasoned with pepper and salt. Put on a well-greased tin in a hot oven. Bake until brown, then turn so that both sides are brown.

Sausage and Egg Pie.

Bring 1 lb. pork sausages to boil and simmer very gently until they feel quite firm. Allow to cool, then remove skin and cut into dice. In the meantime boil 4 or 5 eggs until hard and cut them into slices. Melt 1 tablespoon butter in a saucepan, add 1 tablespoon flour, cook a little, then add 2 cups milk or white stock. Stir over gas until thickens, then add 1 dessertspoon grated onion, 1 tablespoon each tomato sauce and shredded and fried bacon, 1 cup diced potatoes, sausages, eggs, 1 teaspoon chopped parsley, salt and pepper to taste. Place in a pie-dish and cover with puff pastry and bake in a hot oven for ten minutes, then lower heat and bake for half an hour.

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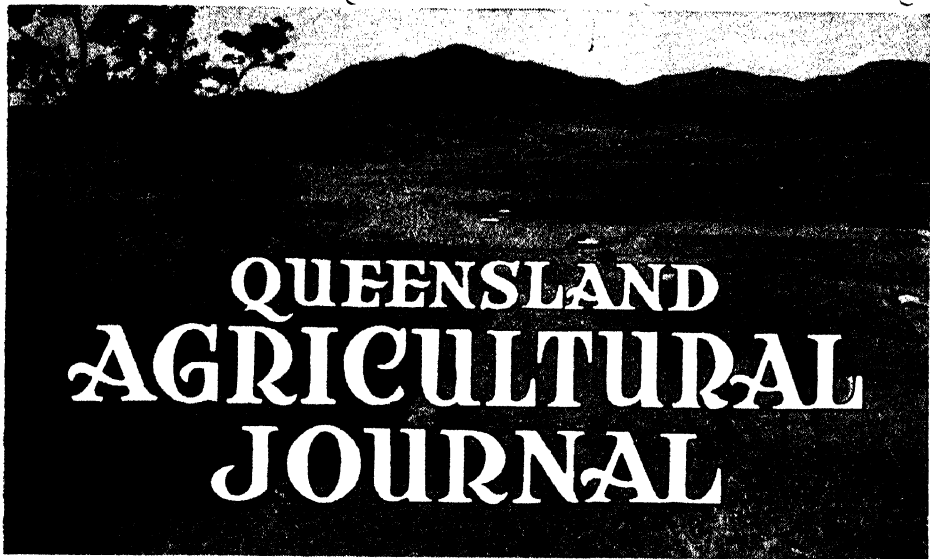
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Part 5

Event and Comment.

Anzac.

FOR Anzac Day this year, 25th April, Dr. C. E. W. Bean, official historian of the Australian Imperial Force in the Great War of 1914-1918, wrote this requiem:—

On this day, above all days, we recall those who did not return with us to receive the welcome of their nation; those who still sleep where we left them, amid the holly scrub in the valleys and on the ridges of Gallipoli, on the rocky, terraced hills of Palestine, in the lovely cemeteries of France, in the shimmering haze of the Libyan desert, of Bardia, Derna, Tobruk; amid the mountain passes and olive groves of Greece and Crete, the rugged, snow-capped hills of Syria, the rich jungle of Malaya, New Guinea, and the Pacific Islands; amid loving friends in our Mother Country and in our own Far North; and in many an unknown resting place in almost every land and every sea. We think of those of our women's services who gave their lives in our own and foreign lands, and particularly of those who proved, in so much more than name, the sisters of our fighting men.

We recall also those staunch friends who fought beside us on the first Anzac Day—our brothers from New Zealand, who helped to create that name; the men of the Royal Navy, and of the 29th and other British divisions, the Indian mountain gunners and our brave French Allies. We recall all those who have since fallen fighting shoulder to shoulder with us—who gave their lives in the Eighth Army, the Royal Air Force,

in all the British and Dominion forces and the ranks of the American Allies who came at our call. We think of those British men, women, and children who fell when, for the second time in history, their nation and its kindred stood alone against the overwhelming might of an oppressor until the world rallied and hurled him back. We think of the peaceful millions in prostrated Europe, in defiant Greece, Russia, and China, whose graves cry for their longed-for deliverance. We think of our loyal friends among the people of New Guinea and elsewhere. We think of every man, woman, and child who in those crucial hours died so that the lights of freedom and humanity might continue to shine.

May they rest proudly in the knowledge of their achievement, and may we and our successors in that heritage prove worthy of their sacrifice.

Farmers are Key Men.

EARLY in the war, the British Minister of Agriculture said: "We shall have to move heaven and earth to win this war, but it is no use moving heaven if we do not move the earth as well." That was done, and is still being done in Britain. Since 1939, 7,000,000 additional acres of land have been brought into production, and the result is that Britain is becoming more and more self-sufficient in food. The whole nation has become food conscious, realising that in its own soil is an insurance against want and the fear that want engenders. It sees agriculture as a key industry and recognises farmers as key men. Whether agriculture will hold its high priority in public appreciation remains at present beyond any attempt at prophecy, because so much will depend on world conditions when the world regains its sanity. Then, it is believed, food production will be among the primary considerations in peace proceedings. Already Britain is considering how far agricultural measures taken under war-time stress and bringing such striking results may be applicable to a permanent peace-time policy. Whatever that policy may be, it is obvious that it must influence the conditions of primary industry in the food-exporting Dominions for which pre-war Britain provided a constant and profitable market. Although, as yet, no official statement of Britain's post-war agricultural policy has been made, the need of a definite plan has been stressed by various responsible bodies representative of rural industry and opinion with a unanimity which is almost incredible to anyone with some experience of the variety of viewpoints in British agriculture and of its traditional resistance to change in outlook and practice. Predominant among newly accepted principles is one based on the need for international action to stabilize prices of primary products and a realisation that no country can insulate its farming industry from the economic shocks of world variation in values. It is plain, therefore, that any consideration of a post-war policy for Australian agriculture, in respect of export commodities particularly, demands our best and clearest thought and competence, courage, and far-sightedness in its application.

Field Crops

Silo Construction.

L. WOOD, Field Officer, Agricultural Branch.

IN Queensland, three types of silo are in use—trench, circular pit, and tower. The construction of the trench type of silo is so simple that the description already given* requires no amplification. The construction of the other two types, however, is more complicated and, in the case of the tower silo, calls for the use of reinforced concrete; the circular pit silo may have only a concrete collar, but it is preferable to have it completely lined with concrete. It therefore seems appropriate to deal firstly with the mixing of concrete, and then to discuss the construction of the tower and the circular pit types of silo in such detail as is requisite.

Selection of Concrete-making Materials.

Due care should be exercised in the selection and measuring of the sand, metal or river gravel, and water to be used in making the concrete mixture. The quality and proportions of the materials used have a definite influence on the strength of the concrete made from them. The sand should be clean and sharp and free from all vegetable matter, such as leaves and grass roots, as well as from any other foreign matter. It may be tested by rubbing a small quantity between the hands, and should doing so cause them to become dirty, the sand must be washed. It may be washed in a small trough 6 feet long and 1 foot 6 inches wide, a small cut being made at one end through which the foreign matter is carried off by a flow of water. The sand should be stirred round with a shovel, and the flow of water maintained until all foreign matter has been removed. Very fine sand is not as suitable as that which is classed as medium fine. If fine screenings from crushed rock are procurable they may be used instead of sand. The term metal is applied to the coarse aggregate which is actually crushed rock, and for general concrete work any hard rock may be used; it should range in size from about $1\frac{1}{2}$ inches in diameter to small screenings about half that size. It is sometimes imagined that very large stones tend to strengthen concrete but, while they may be used in thick walls and foundations with a view to saving cement, they should not be used where the thickness of the concrete is not sufficient to give at least $1\frac{1}{2}$ inches of material between the "plums," as they are called, and the outer face of the concrete. Where river gravel is used instead of metal, the sand naturally occurring with it will have to be screened from it because river-run gravel usually contains a large percentage of sand. The correct quantity of sand required for the concrete mixture will then have to be added to the river gravel

* *Queensland Agricultural Journal* for April, 1944, p. 206.

which has been freed from the unknown proportion of sand which it contained when it was dug from its bed. It is important that only clean water, free from oil and dirt, be used.

Proportions, Mixing, and Placing of Materials.

A measuring-box should be employed to ensure that the correct proportions of the materials for the concrete mixture are used. When the proportions in which they are to be mixed are 4-2-1—i.e., 4 parts of metal or river gravel, 2 parts of sand, and 1 part of cement—a bottomless box with sides measuring 2 feet 1 inch by 2 feet and 1 foot deep, inside measurements, should be constructed with a division in the middle. This will hold exactly 4 cubic feet of metal when the whole of the box is filled level. Two cubic feet of sand is then measured out, by filling one-half of the box, and one paper bag of cement is added to the other two materials. This gives a conveniently sized batch to mix by hand. Cement is now supplied in paper bags which hold 1 cubic foot, twenty-four of which weigh 1 ton.

When mixing by hand the work is facilitated by constructing a proper mixing board, which should be about 10 feet by 10 feet. The dry material should be mixed thoroughly until it is all of a uniform colour. The water should be added by using a watering-can with a rose attached, the dry materials being gradually wetted as the mass is being turned. The water should not be allowed to run off the mixing board because, if it does so, it carries away a large proportion of the cement with it. The materials should be thoroughly mixed after the water has been added, and the concrete placed in position as soon as possible after mixing. It should be well rammed as it is being placed in the moulds, and the surface should be roughened before finishing the layer off in order to form a key, and so ensure a good bind for the next layer. The joint must be strengthened with cream of cement before adding fresh concrete to that which is set; this can be prepared by adding sufficient water to some neat cement to bring it to the consistency of thick cream. Green concrete will not stand a bump, and care and patience is necessary when removing the moulds. All working tools, such as buckets and shovels, and the mixing board should always be attended to when mixing is finished, and should be thoroughly washed before the concrete sets on them.

Reinforcement of Concrete.

It is sometimes necessary—and, indeed, in the case of a tower silo it is essential—to strengthen the concrete by embedding within it steel in the form of rods, wire-netting, or some other type of metal mesh. The steel is elastic and extremely strong in tension, while concrete is strong in compression, but comparatively weak in tension. The combination of the two materials with their opposite characteristics, therefore, gives an ideal product, known as reinforced concrete.

Size of Silo.

One of the first points to be considered when preparing to build a tower or circular pit silo is the size that will meet the requirements of the farm on which it is to be erected. In determining the required size, consideration must be given to the number of head of stock it is intended to feed, and to the duration of the feeding period. As each cow is fed at the rate of approximately 30 lb. of silage daily, it is a simple matter

to arrive at the required size on a dairy farm. The following table of capacities will be useful in determining the size to build, allowing 51 to 56 cubic feet of silage to the ton, the smaller figures being applicable to the larger silos. These calculations are based on the assumption that the silos are completely full of consolidated silage, which, of course, is rarely possible as some allowance must be made for subsidence. However, if the material is well trampled during the whole time filling operations are in progress, only a small allowance need be made for subsidence.

APPROXIMATE CAPACITY OF ROUND SILO IN TONS.

Inside Height.	Inside Diameter of Silo.						Cubic Feet of Silage to the Ton.
Feet.	10 Feet	11 Feet.	12 Feet.	13 Feet.	14 Feet.	15 Feet.	
20	28	34	40	47	55	63	56
21	29	36	42	50	58	66	56
22	31	38	45	53	61	71	55
23	33	40	47	55	64	74	55
24	35	42	50	59	68	78	54
25	36	44	52	61	71	82	54
26	38	46	56	65	76	87	53
27	40	48	58	68	78	90	53
28	42	51	61	71	83	95	52
29	44	53	63	74	86	99	52
30	46	56	67	78	91	104	51

The following table shows the quantities of materials required in the construction of each foot of a concrete silo wall of 4-inch thickness when using a 4-2-1 mixture; it also gives the materials required for the foundations of a tower silo:—

Diameter In Feet.	Portion of Silo.	Metal or River Gravel.	Sand.	Cement.
		Cubic Feet.	Cubic Feet.	Cubic Feet.
10	Wall	9.36	4.68	2.34
	Floor	23.12	11.56	5.78
	Foundations ..	49.20	24.60	12.30
11	Wall	10.28	5.14	2.57
	Floor	27.40	13.70	6.85
	Foundations ..	54.12	27.06	13.53
12	Wall	11.00	5.50	2.75
	Floor	32.00	16.00	8.00
	Foundations ..	58.80	29.40	14.70
13	Wall	11.92	5.96	2.98
	Floor	38.20	19.10	9.55
	Foundations ..	63.52	31.76	15.88
14	Wall	12.88	6.44	3.22
	Floor	44.52	22.26	11.13
	Foundations ..	68.20	34.10	17.05
15	Wall	13.80	6.90	3.45
	Floor	51.08	25.54	12.77
	Foundations ..	72.64	36.32	18.16

Tower Silo Construction.

Details for the construction of a tower silo are given in the following paragraphs, quantities of materials, moulds, and construction being discussed in considerable detail.

Quantities of Materials.

The following materials are required for the construction of a tower silo 14 feet in diameter and 28 feet in height, with walls and floor 4 inches thick, and designed to hold approximately 83 tons of silage:—

		£	s.	d.
Concrete—				
Metal or river gravel, 17½ cub. yds., at 12s. 6d. per yd.	.. .. .	10	15	0
Sand, 8½ cub. yds., at 10s. per yd.	.. .. .	4	6	0
Cement, 116 bags, at £4 14s. per ton	.. .. .	22	17	4
Reinforcement, comprising—				
Round bars, ¾ in., 6 cwt. at 17s. per cwt.	.. .. .	5	2	0
Tie wire, 5 lb., at 6d. per lb.	.. .. .	0	2	6

Door Frames (3)—

5 in. x 4 in.—6/2 ft. 10 in. to cut 12 bevelled pieces, 3 in. x 2 in. x 4 in.	}	1	7	0
2 in. x 2 in.—12/2 ft. 6 in.				
4 in. x 1 in.—14/2 ft. 6 in.				
6 lengths ¾ in. x 1 ft. spikes with end hooked for holding frame in position	.. .. .	0	1	6

Roof Timber—

Rough Hardwood—

Bearers, 5 in. x 3 in.—2/12 ft. 6 in., 2/17 ft.	} 98 super ft., at	2	1	4
Collar ties, 4 in. x 2 in., 4/8 ft.					} 43s. per 100

Rough Pine—

Rafters, 4 in. x 2 in.—14/9 ft.	} 184 super ft. at 3 4 0 35s. per 100
Braces, 3 in. x 1½ in.—2/18 ft.	
Battens, 3 in. x 1½ in.—8/17 ft.	
Ridge Board, 7 in. x 1 in.—1/17 ft.	
Fascias, 7 in. x 1 in.—2/9 ft.; 2/17 ft.	

Bolts, Corrugated Iron, &c.—

Anchor bolts and screws, 8/1 ft. 6 in. x ½ in., for securing plates to top of wall, at 2s. each	.. .. .	0	16	0
Bolts for collar ties, 6/4½ in. x ¾ in. at 3d.	.. .. .	0	1	6
Hoop iron strips, 14/1 ft. 6 in. long, to strap rafters to bearers, at 2d. per lb.	.. .. .	0	4	5
18 sheets 9-ft. iron, at 5s. 5d. per sheet	.. .. .	4	17	6
3 lengths ridge capping, at 1s. 9d. each	.. .. .	0	5	3
3 lb. springhead screws, at 2s. 1b.	.. .. .	0	6	0

Nails—

3 in. x 9 gauge (5 lb.)	} at 4d. lb.	0	3	4
4 in. x 8 gauge (3 lb.)				
2 in. x 11 gauge (2 lb.)				

Ladder—

Rough pine, 3 in. x 2 in., 2/30 ft., at 35s. per 100 super. ft.	0	10	6
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Rungs—

Bolts, 4/1 ft. 6 in. x ½ in., at 1s. 6d. each	0	6	0
21 lengths iron, 14 in. long, at 2d. per length	0	3	6

Paint

..	0	5	0
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Cost of materials £57 15 8

Cost of labour—

Excavation for foundation, &c., approximately 3 ft. below ground level, 26 cub. yd., at 4s. per yd.	5	4	0
Mixing and placing all concrete, &c., 1 man 10 days at £1 2s. 8d. and 3 men 10 days at 17s. 8d.	.. .. .	37	16	8
Constructing roof, doors, ladder, &c., 1 man 2 days at £1 2s. 8d. and 2 men 2 days at 17s. 8d.	.. .. .	5	16	0
Cartage, &c., on moulds, timber, &c.	.. .. .	3	0	0

Cost of labour £51 16 8

The total cost is thus £109 12s. 4d., but this figure will naturally be subject to considerable fluctuation from year to year and from locality to locality.

Moulds.

In the construction of the tower silo it is necessary to use moulds or forms of some description when placing the concrete mixture in position in the gradually rising wall of the silo. These moulds are made in sections and usually consist of eight inside and eight outside sections about 3 feet high (Plate 120). If the moulds are set up level at the commencement of construction little difficulty is experienced in keeping the wall of the silo plumb and in a true circle. A wooden frame covered with flat galvanised iron is the type of mould recommended as the most suitable, because it is light and easily handled. The galvanised iron facing gives a smooth finish to the work, which is necessary on the inner surface of the silo to prevent settling of the silage being retarded. With a view to assisting farmers in the construction of silos the Department of Agriculture and Stock has made a number of sets of moulds of this type, which are lent to farmers on application.

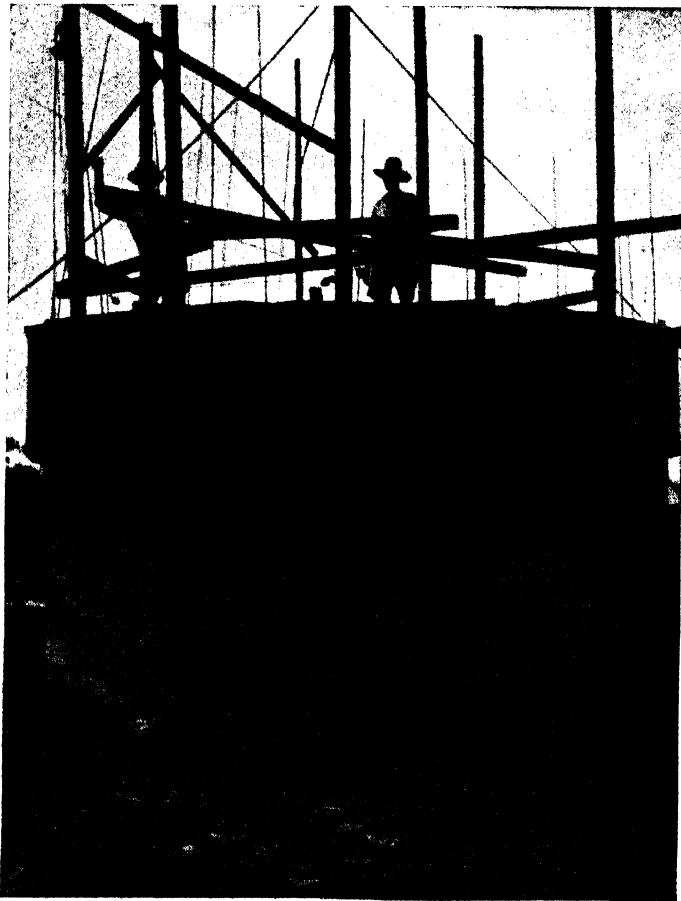


Plate 120.

TOWER SILO IN COURSE OF CONSTRUCTION.—Showing Moulds in Position for Filling.

Marking Out the Site.

All that is required to mark out the site for the silo is a piece of string and two pegs. One peg is driven into the ground at the spot

which is to be the centre of the silo. A piece of string is then fastened to this by a loop, the other peg being attached to the string at a distance from the centre peg equal to half the outside diameter of the foundations. A circle is then described, which will be the outside circumference of the silo.

Foundations.

The weight of the materials required to build a tower silo of the dimensions given amounts to approximately 30 tons, and it is therefore evident that a solid foundation is necessary; otherwise settling will occur which will have the effect of cracking the wall and causing considerable damage to the structure. The foundations should be 2 feet wide and 1 foot deep, and every care should be taken to ensure that the wall is constructed in the middle of the foundations so that the weight of the wall will be evenly distributed. The soil should be excavated to a depth of approximately 3 feet, and deeper still if a compact soil is not reached at this depth. By excavating, the height above ground is reduced and a solid foundation below the frost line is assured. If in doubt about the soil formation, it is advisable to obtain advice from some person experienced in concrete construction so that sound foundations will be laid. Steel reinforcing rods $\frac{3}{4}$ inch in diameter should be placed in the foundations spaced about 9 inches apart and connected by No. 8 fencing wire.

Floor and Reinforcement.

The floor, which is usually 4 inches thick, should also be reinforced with $\frac{3}{4}$ -inch diameter rods, placed at 1 foot 6 inch centres, hooked and tied to the rods of the foundations. In placing the concrete, the foundations and floor are laid in the one operation, but before pouring the concrete, provision should be made to place the vertical reinforcing rods in position. These rods, which should be placed at intervals of 2 feet, are hooked and tied to the reinforcement in the foundations. Horizontal reinforcement should be wired to the vertical rods already set when the concrete is placed for the foundations. Where it is necessary to join horizontal reinforcement, the rods should be lapped at least 1 foot 3 inches and tied together with tie wire. For vertical reinforcement a lap of 1 foot 6 inches is necessary. The first horizontal ring of rods should be placed about 3 inches above the floor, and from there upwards to a height of 8 feet 3 inches the rods should be spaced at foot intervals; for the next 7 feet 6 inches they should be spaced at 1 foot 6 inches intervals, and from that height to the top of the silo every 2 feet. The closer spacing towards the bottom of the silo is necessary to withstand the pressure exerted by the settling of the silage. Provision should be made in placing the rods in position to allow for doors, which are spaced 5 feet apart, the first being at $2\frac{1}{2}$ feet from the ground and the other two at 5 feet intervals, one above the other. All reinforcing should be well covered with concrete, as any rusting due to exposure of the steel will weaken the structure.

Building the Wall.

The moulds should be well greased before use in order to prevent adhesion of the concrete and to facilitate their removal. Crude oil or soft soap is generally used for this purpose and is applied with a swab. Each time the moulds are removed they should be scraped to remove any adhering concrete and then regreased before being placed in the

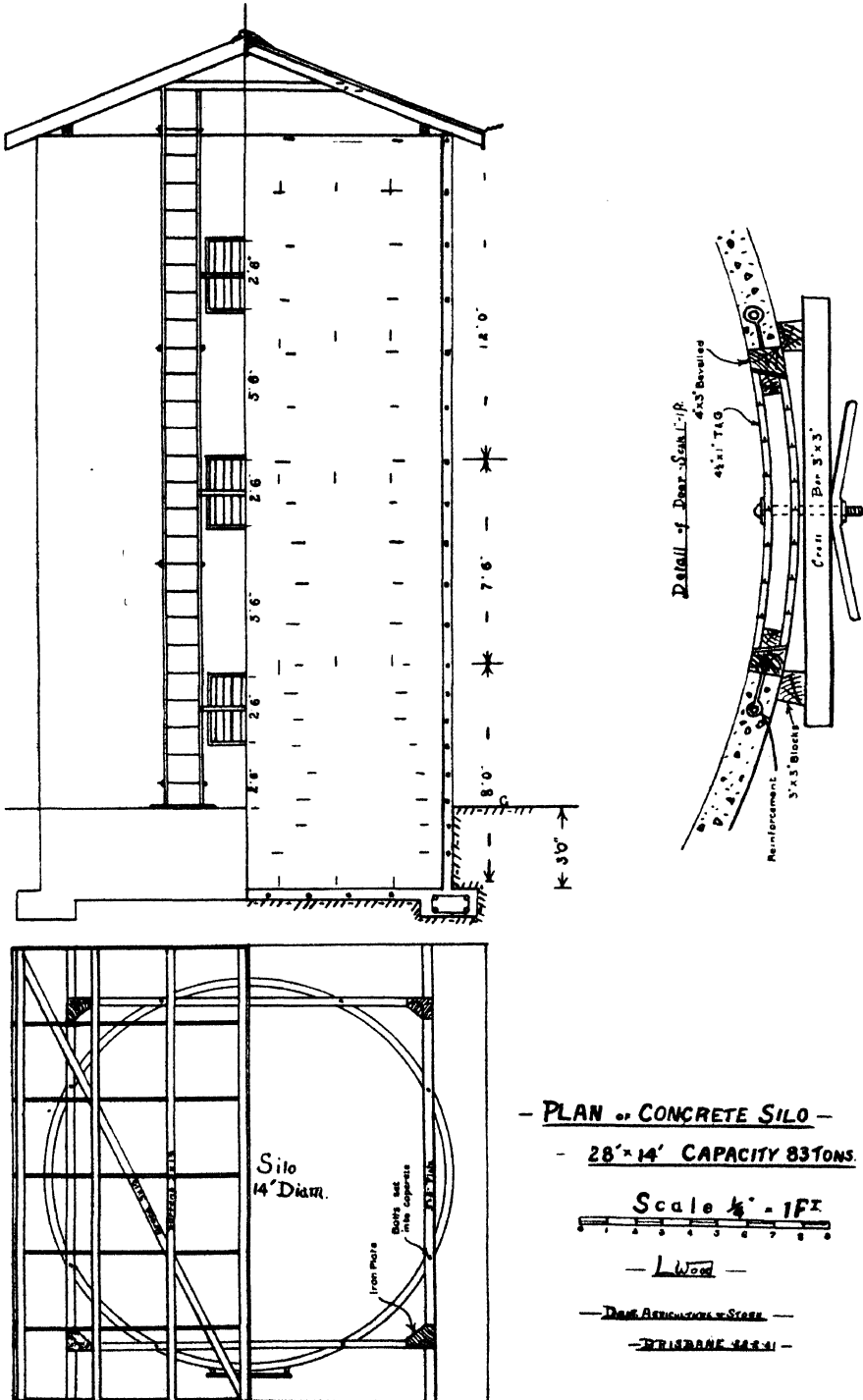


Plate 121.

PLAN OF TOWER SILO.

next position. Each inside mould is held in position by the 4-inch by 3-inch or other suitable upright which passes through a mortice provided in the mould for that purpose. The uprights should be plumbed and well braced to ensure that the wall is true. As the outside moulds have no uprights to support them it is necessary that they be bolted to the inner circle using long bolts for this purpose. These bolts should be greased before use to enable them to be withdrawn easily. The small holes which are left after their removal are then plugged up with fine mortar.

Another method of supporting the outside moulds and scaffolding is to place eight slightly tapered blocks, $4\frac{1}{2}$ inches by $3\frac{1}{2}$ inches and 4 inches long, in between each section of the moulds about 2 inches below the top, before the moulds are filled with concrete. After the moulds have been removed, the blocks are taken out by tapping the smaller end lightly. Their removal in each case leaves a hole in the wall through which a bearer or "pudlock" about 8 feet 6 inches long is inserted, allowing one end to project about 1 foot 3 inches on the outside of the wall. The other end is supported on a cleat bolted around a 4-inch by 4-inch upright placed in the centre of the silo. The blocks are placed in position for each rise and the cleat is moved up the 4-inch by 4-inch upright to carry the ends of the bearers which support the moulds and scaffolding planks. The holes in the wall are usually filled in while the scaffolding is at a suitable height. This is done by inserting small concrete blocks, cast to the required size, which are then plastered over.

Before placing a fresh batch of concrete, the previous layer should be well cleared of any loose material and moistened, and to it there should be applied a thin covering of cream of cement. Only small quantities of the latter should be mixed at a time and care should be taken to ensure that it has been spread over the whole surface before adding a fresh layer of concrete.

The concrete should be well rammed into the moulds in order to secure a smooth dense wall which will be airtight and impervious to water. A spading tool made from a piece of $\frac{1}{2}$ -inch iron about 6 feet long with a fish tail at the lower end, or a piece of thin board bevelled at one end and run off to form a handle at the other end may be used. The use of this tool forces the coarse material away from the mould, allowing the finer mortar to come to the face of the wall and produce a smooth surface. Each day the moulds are lifted, allowing for about 2 inches of a lap on the previous ring of concrete.

Door Frames.

The frames for the doors, which should be 2 feet 6 inches square, should be constructed with 5-inch by 4-inch hardwood sawn lengthways to make bevelled pieces 3 inches by 2 inches by 4 inches. The frames are made with the bevelled edges towards the inside of the silo (Plate 121) on the same principle as that of a refrigerator door so that when the doors are placed in position they may be screwed up tightly, to exclude the air, with a hand screw and bolt. The doors are constructed on bevelled frames to suit the opening, lined on both sides with 4-inch by 1-inch tongue and groove, the space between being filled with sawdust or some other insulating material; if required, the doors can be packed with felt or bagging to ensure a tight fit.

Difficulty is often experienced in keeping the silage in good condition around these doors, but if the instructions are carried out as detailed, little trouble will be encountered. Before setting the frames in position a few pieces of $\frac{3}{8}$ -inch iron about 1 foot in length should be driven into the frames at the sides, top and bottom, and connected to the reinforcing rods.

Roof.

The bearers to which the roof is fastened on the silo should be of heavy timber 5 inches by 3 inches and fastened to the top of the wall by bolts which have been set in the concrete. Anchor plates also should be bolted at each corner of these bearers; the two side bearers project 1 foot past the line of the side to allow for an overhang on the roof. Rafters 4 inches by 2 inches, spaced at 2 feet 9 inch intervals, should be securely nailed and strapped down to the bearers by $1\frac{1}{2}$ -inch hoop-iron straps. Four 4-inch by 2-inch collar ties are secured to every second pair of rafters about half way up. Roof braces 3-inch by $1\frac{1}{2}$ -inch should be nailed diagonally across on the underside of the rafters, and 3-inch by $1\frac{1}{2}$ -inch battens should be spaced every 3 feet. To give a finished appearance and make the silo weather-proof 7-inch by 1-inch fascias and barge boards should be securely nailed to the ends of the rafters before placing the iron in position. For securing the corrugated iron, springhead screws are preferable to nails as they withstand the elements better.

Ladder.

It is necessary that a long ladder be constructed and fixed to the silo alongside the doors. This can be made with 3-inch by 2-inch sides using lengths of $\frac{1}{2}$ -inch iron about 14 inches long for rungs. Four $\frac{1}{2}$ -inch bolts 1 foot 6 inches long should be placed about 10 feet apart to prevent the sides spreading. The inside width of the ladder should be 12 inches, thus allowing the rungs to be sunk 1 inch. Rungs should be spaced every 15 inches. The ladder is secured in position by placing it on to a sill piece and cleating the bottom, and bolting it to the roof timbers by a "bracket" or piece of timber on the top.

Scaffolding.

In the construction of the silo it is necessary that some kind of scaffolding be used and the timber required for the construction of the roof is generally made use of for this purpose. There are several methods of erecting this scaffolding, a very simple one being to place four uprights about 7 feet apart on the inside of the silo to which cross rails are secured at the height at which it is desired to erect the scaffolding. The rails are allowed to project past the uprights to about 9 inches from the wall and these projections carry the scaffolding planks, or if, as previously described, pudlock bearers are used, the planks may be placed both on the inside and outside of the silo. If a piece of heavy timber is bolted across the uprights about 8 feet above the scaffolding and allowed to project over the outside wall about 3 feet, the pulley blocks can be attached to this projection, thereby greatly assisting in the hoisting of materials.

Circular Pit Silo Construction.

As stated earlier, a circular pit silo may be either wholly concrete lined or the concrete lining may be confined to a collar 5 feet 6 inches in depth, the former type of silo being regarded as the better of the two.

The site of the circular pit silo is marked out in the same manner as adopted in the case of the tower silo, and a precisely similar type of mould is used for both. The details of the mixing and pouring of the concrete have already been fully dealt with when considering tower silo construction and further reference to them is unnecessary.

Sinking the Pit.

The sinking of the pit calls for the use of a considerable amount of labour, but much of the cost involved therein can be saved if the farmer does the work himself. To facilitate the digging of the pit, and the removal of the silage, as required, when the pit is completed and filled, a hoist (Plate 122) is so constructed as to allow it to swing over the pit. When sinking the pit, the earth or spoil is hoisted out of it in a large drum with a hinged bottom and a lever catch attachment. The drum, full of spoil, is pulled to the surface by a horse, swung clear of the pit and, while the drum is suspended in the air, the catch is released, the hinged bottom of the drum drops, and the contents are deposited on a dray or where they may be readily removed afterwards.

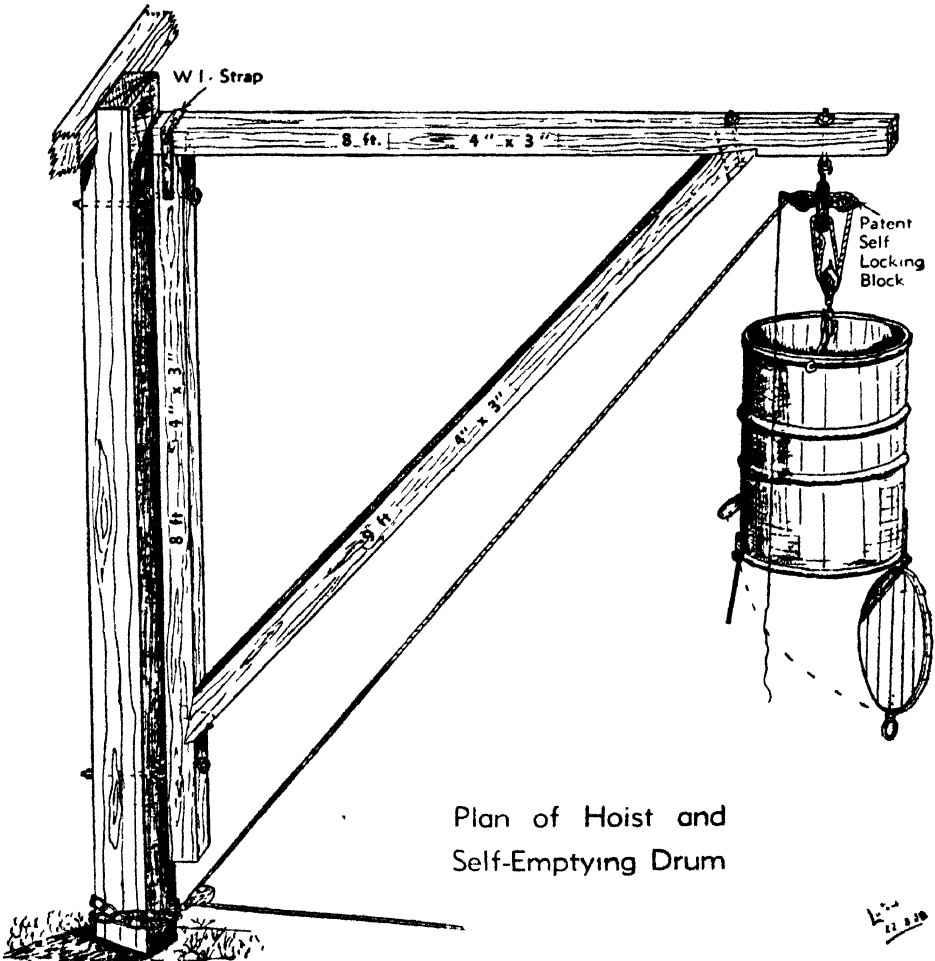


Plate 122.
HOIST.

by a horse and scoop. The hoisting gear should be provided with a patent self-locking pulley, which locks and keeps the load in any position without tying or holding the hoisting rope, the locking device coming into action the moment the rope is slackened. This self-locking block ensures the safety of the man working in the pit.

When trimming the wall of the pit, a piece of timber is placed across the diameter of the excavation, and held in position by means of pegs. Through this piece, a hole is bored to allow a length of piping to be placed vertically in the centre of the pit. A board equal in length to half the diameter of the desired excavation is then made to revolve around the pipe, which is kept plumb. This board acts as a guide or indicator, so that the wall may be trimmed perfectly true with a sharp mattock or old adze (Plate 123).

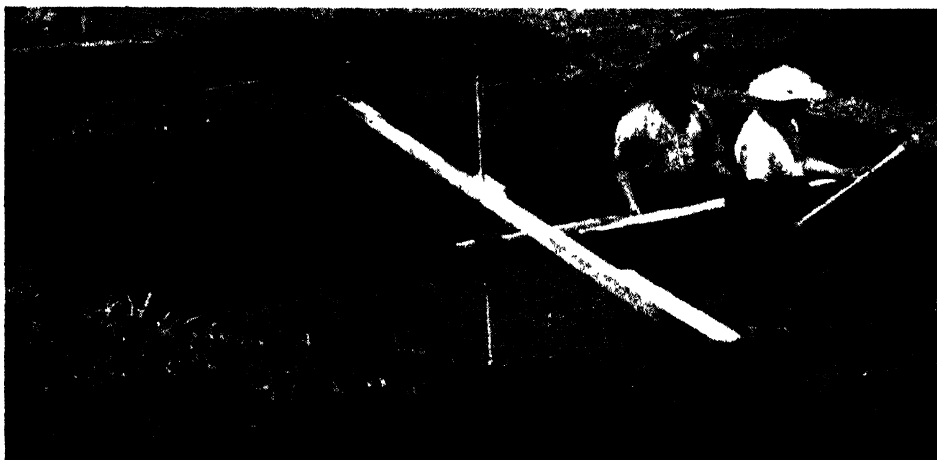


Plate 123.
TRIMMING THE PIT

Building the Concrete Wall.

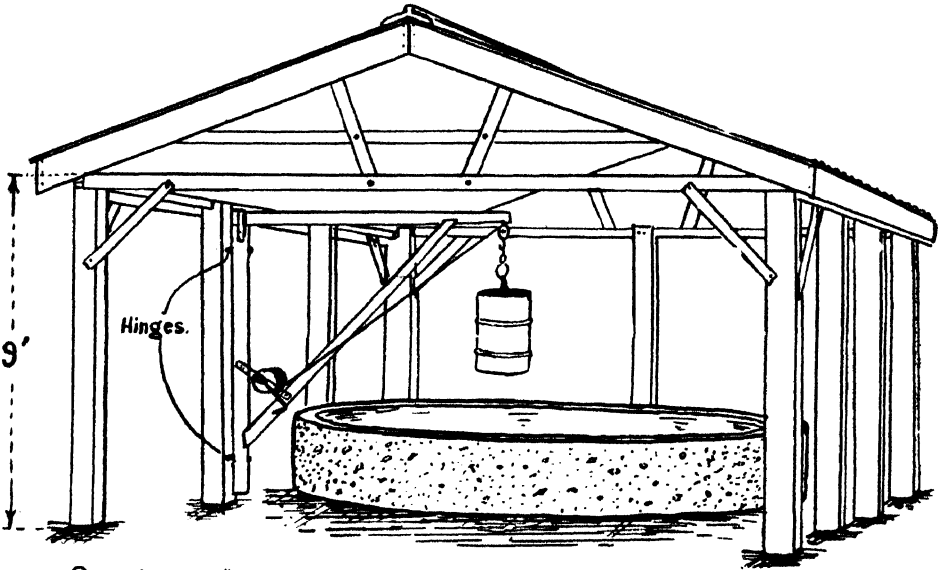
When the wall has been trimmed and the bottom of the pit levelled the inside set of moulds is placed in position and filled with concrete. If carefully handled, the moulds may be removed the following day and set up for the next lift and filled again. It is not necessary to use the outside set of moulds until the top of the pit is reached. When both sets of moulds are used, spacing pieces must be placed between them to ensure that the correct thickness of wall is maintained. The concrete wall should be continued to a height of $2\frac{1}{2}$ feet above ground level.

It is here necessary to refer to the fact that, in marking out a site for a circular pit silo with an inside measurement of 14 feet, allowance must be made for the 4-inch wall and the final excavation must therefore be 14 feet 8 inches in diameter. It is, however, thought preferable to initially excavate only 14 feet, thus leaving 4 inches all round to be removed in the trimming of the wall. This trimming is carried out every few feet as sinking progresses and enables the excavator to obtain a nice even surface.

Covering the Silo.

A shed covering is as essential in a circular pit silo as in the case of a tower. It may be a permanent fixture, providing ample head room to work under (Plate 124) or it may be a sliding roof. The former is preferable, as its cost of construction is little in excess of the latter, and it affords protection from the elements when emptying or filling the pit.

24' x 18' SHED OVER SILO.



Scale $\frac{1}{4}$ \" = 1 FT.

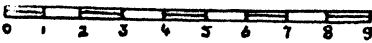


Plate 124.

PLAN OF COVERING SHED.

Quantities of Materials.

The following materials are required for a 28-foot pit silo with 25 feet 6 inches below ground level and 2 feet 6 inches above ground level, the silo to be concreted to the full depth with a 4-inch wall and floor. A 4-2-1 concrete mixture is allowed for. Provision is made for a shed 24 feet by 18 feet with a clearance of 9 feet, and for a hoist erected to assist in emptying operations, the hoist to be fixed to a convenient post by hook and eyebolt hinges.

Concrete—

	£	s.	d.
Metal or river gravel, 15½ cub. yds., at 12s. 6d. per yd.	9	10	7
Sand, 7 5/9 cub. yds., at 10s. per yd.	3	15	6
Cement, 102 bags, at £4 14s. per ton	19	19	6
Reinforcement (floor and portion of wall above ground level only), 32 yds. K wire	0	18	0

Shed and Hoist—

Posts, 5 in. x 5 in., or round bush timber—9/11 ft., at 9d. per ft. . .	3	14	3
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Rough Hardwood—

Plates, 4 in. x 3 in.—2/24 ft., 2/18 ft.	} at 43s. per 100 super. ft.	2	3	0
Corner, 4 in. x 2 in.—4/6 ft.				
Post bracers				

GROUND PLAN.

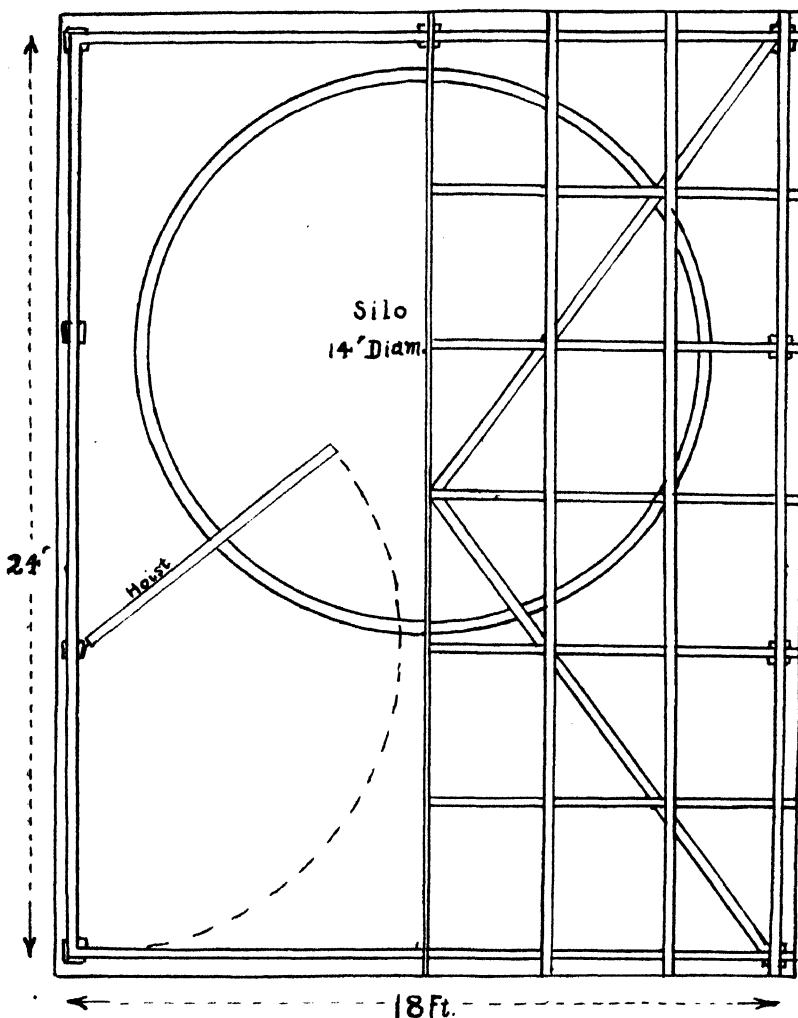


Plate 125.

GROUND PLAN OF COVERING SHED.

Rough Pine—

Rafters, 4 in. x 2 in.—14/10 ft. . .	£ s. d.
Collar ties for roof, 4 in. x 2 in.—	
3/12 ft.	
Struts for roof, 4 in. x 2 in.—4/3 ft. . .	
Braces for roof, 3 in. x 1½ in.—	
4/15 ft.	
Battens for roof, 3 in. x 1½ in.—	
8/25 ft.	
Fascias for roof, 7 in. x 1 in.—	
2/25 ft., 4/10 ft.	
Ridge Board, 7 in. x 1 in.—1/25 ft. . .	
at 35s. per 100 super. ft. 5 1 6	

Rough Hardwood—Hoist, 4 in. x 3 in.—2/8 ft., 1/9 ft., at 43s. . .	0 10 9
Iron, 28/10 ft. sheets, at 5s. 8d. sheet	7 18 8
Ridge capping—5/6 ft. lengths, at 1s. 9d. per length	0 8 9

Nails—	£	s.	d.
3 in. x 9 gauge (5 lb.), at 4d.; 4 in. x 8 gauge (3 lb.), at 4d.;			
Springheads (5 lb.), at 1s. 2d.	0	8	6
Bolts for posts, 9/8½ in. x ½ in., at 6d.	0	4	6
Bolts for collar ties, 6/4½ in. x ¾ in., at 3d.	0	1	6
Hinges for hoist—2/4½ in. x ¾ in. eyebolts and 2/8½ in. x ½ in. hooks			
for same, at 4s. 6d. pair	0	4	6
Cost of materials	£54	19	6

Labour—

Erecting shed and hoist, &c., 1 man 3 days at £1 2s. 8d. and 1 man			
3 days at 17s. 8d.	6	1	0
Excavating pit 25 ft. 6 in., at £1 per ft.	25	10	0
Setting up moulds and filling same—2 men 10 days at 17s. 8d. }	29	0	0
1 man 10 days at £1 2s. 8d. }			
Cost of labour	£60	11	0

The total cost of this type of silo is therefore £115 10s. 6d., but, as in the case of the tower silo, costs will fluctuate from year to year and from district to district.

Collar Type of Circular Pit Silo.

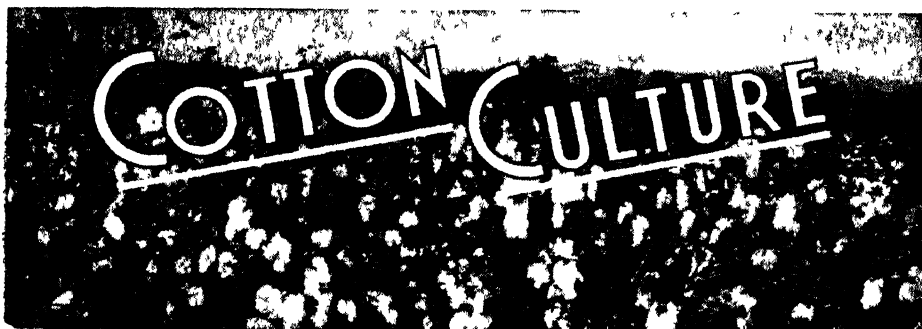
The discussion of the circular pit silo has so far been confined to the type which is wholly concrete lined, but much of the information supplied for that type is equally applicable to the circular pit silo in which the concrete lining is confined to a collar 5 feet 6 inches in depth. In the case of the collar type, however, the diameter of the excavation is 14 feet 8 inches only until a depth of 3 feet below ground level is reached, for at that depth the concrete collar ceases, and from there on the excavation should be only 14 feet in diameter. When the pit has been excavated to a depth of 3 feet, the concrete collar is constructed, the shed is built, and then the pit is excavated until the full depth is reached.

Circular pit silos of other dimensions may, of course, be constructed, but the dimensions given are those most likely to meet the requirements of the average farmer and are the dimensions for which departmental moulds are available on loan.

It has previously been stated that the approximate cost of the fully-lined circular pit silo is £115 10s. 6d., and this compares with an approximate figure of £75 for the collar type. The combined cost of the shed, the hoist, and the excavation are virtually identical, the difference in price being due to the lesser quantity of concrete used.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to the Department of Agriculture and Stock, Brisbane, without delay.



Commercial Cotton Varieties in Queensland.

R. W. PETERS, Research Officer.

THE varieties of cotton grown in Queensland are all of the American Upland type, as this class of cotton appears to be the most suitable for the main cotton-growing areas, the climatic and soil conditions of which are somewhat similar to those ruling in many parts of the United States, where this type of American cotton is grown. Also these cottons, with their large bolls and coarse fibre, can be picked and ginned much cheaper than the small boll, fine-diametered, long-stapled types of cotton, which is most important, for the cost of production and harvesting is one of the main problems connected with cotton-growing in this country.

Since 1923 a large number of varieties of the American Upland type have been tested in Queensland. Many of these cottons yielded little if any promise of being suitable for the conditions here. Others appeared promising in the first few seasons after their introduction but eventually exhibited serious faults, which finally resulted in their withdrawal from distribution to farmers. It has been possible, however, to discover suitable varieties for each of the major soil types on which cotton is grown in the main cotton-growing districts. By means of a comprehensive breeding programme, as outlined in the September and October numbers of this Journal, improved types have been evolved in several of these varieties and are being commercially grown. More recently developed strains of them now in the breeding and testing plots give promise of further improved stocks of seed being available soon for distribution.

The importance of a farmer growing the most suitable variety for his conditions cannot be overstressed. Accordingly, the following descriptions of the main varieties grown in Queensland and their suitability for the cotton-growing districts south of Mackay are given to assist growers in selecting the best variety for them to plant. It is stressed, however, that if at all possible groups of farmers with comparable conditions should endeavour to grow only the same variety. The merits of one-variety communities, and of having as few varieties as possible for the State, have been described in the April number of this Journal. It is suggested,

therefore, that each community obtain the advice of the local district officer of the Department of Agriculture and Stock to assist in the development of one-variety community-growing.

Lone Star.

This variety was introduced in 1923 but for a number of years it showed little evidence of being suitable for conditions here, and it was not until the 1929-30 season, when it was transferred to Mundubbera and planted on an ironbark slope interspersed with patches of brigalow that the variety gave indications of being of much value here. Suitable strains were developed for the conditions of that district and were then distributed throughout the Central Burnett, where the variety became most popular and still remains the predominant cotton. Actually, Triumph is the only other variety grown in this particular district, and is confined to fertile alluvial flats and softwood scrub areas.

Lone Star, when introduced, was very vigorous in its habit of growth with usually four strong basal vegetative branches, while the foliage was very coarse. Continuous breeding has changed the type considerably, however, so that the description of a typical Lone Star plant at present is as follows:—

Growth vigorous and of medium height, with two to four basal vegetative branches, two of which are usually large but fruit well. The internodal distance between the joints on the main stem is somewhat short. The fruiting branches are numerous with a well-defined alternation of the internodes giving the branch a zig-zag type of growth. The lower fruiting branches are horizontal but the upper ones, which naturally become shorter are slightly acute of horizontal, giving the plant an open habit which allows of good ventilation and sunlight penetration. Foliage is medium to large and very dark-green in colour. The bolls are well spaced on the fruiting branches and are large to very large with five locks predominating. In shape they are broadly ovate with short, blunt points. They usually open well and are decidedly stormproof.

The fibre of bulk stocks of the variety has an average length of a full inch; but usually where Lone Star is grown under good conditions or under irrigation, a length of $1\frac{1}{8}$ inch may be reasonably expected. The fibre characters—drag, body, and strength—are all good. The percentage of lint approximates 36.5. This type of cotton is very suitable for the requirements of the Australian spinners and there is always a ready market for good grades of this variety of cotton. Years of selective breeding have materially improved the suitability of the variety for Queensland conditions; not only have the general characteristics of the plant, such as structure, size of bolls, uniformity of length and strength of the fibre, percentage of lint, and lint index been improved but what appears to be the most important is the increased drought-resistant qualities of the variety. Strains of Lone Star are, therefore, being grown

successfully under a wide range of conditions, which may be summarised for the districts south of Mackay as follows:—

Northern Darling Downs and Maranoa—

The clays to clay loams or even loams, of the plains originally under box forests.

Upland clay loams of the rising lands and foothills of the Dividing Range, and which originally carried box forests as the predominating timber.

Decomposed sandstone areas originally timbered with cypress pine, bulloak spotted gum, and ironbark.

The heavier clay loam types of soil of the brigalow scrubs.

The clay loams of the belah flats.

Red loams to clay loams originally covered with a range of flora varying from forest to scrub.

Alluvial clay loams on main creeks and in the folds and valleys of the Main Range.

Southern District—

The brown to black clay loams of the box forest series.

The brown to red-brown clay loams of the slopes originally timbered with both the broad and narrow-leaf ironbark forests.

South Burnett—

The brown and red-brown clay loams originally timbered with the broad-leaf and the narrow-leaf ironbark, and the gum-top box forests.

Central Burnett—

The brown and red-brown clay loams as in the South Burnett.

The grey and grey-brown clay loams originally timbered with box forests.

The loams overlying a clay subsoil, such as in the Moreton Bay-box forest series.

The brown and grey-black heavy clay loams of the brigalow scrub series.

Upper Burnett and the Central Districts—

The Lone Star variety was grown extensively on the forest and scrub heavy clay loams of these districts for several years. In recent seasons, however, there has been an increasing tendency to replace the variety with Miller, which is slightly quicker maturing and, therefore, has outyielded Lone Star in seasons of late planting. As Miller is also more suitable than Lone Star for the fertile alluvials and softwood scrubs of these districts, its use on the harder soils assists in bringing about one-variety community-growing, and it is recommended that growers in these districts do not plant Lone Star unless there is clear-cut evidence that it outyields Miller on their soils.

[TO BE CONTINUED.]

VEGETABLE PRODUCTION

Vegetable-growing in North Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

PART 3.

Pest and Disease Control.

BECAUSE of the tropical climate of most of the North Queensland area, pests and diseases present a major problem to the vegetable-grower. Pests such as aphids, bean fly, and the corn ear worm and diseases such as anthracnose, fusarium wilt, and mildews must be continually guarded against. Winter mildness allows the life cycle of pests and diseases to continue uninterruptedly throughout the year, so that unceasing vigilance on the part of the grower is necessary. Four methods of minimising their ravages are available; firstly, the growing of quick-maturing varieties; secondly, the use of disease-resistant varieties; thirdly, the use of disease-free seed; and, fourthly, the regular use of disinfectants, dusts, sprays, &c. The use of the first method limits the period during which the plants can be attacked by curtailing to a minimum the period of growth of the crop. The growing of quick-maturing varieties must, however, be limited to those crops for which a local market is available. Such varieties are usually tender and poor shippers, and, consequently, cannot be grown successfully for distant markets.

During the past fifteen or twenty years a considerable amount of work has been carried out on the breeding of varieties resistant to one or more of the diseases to which the particular vegetable is particularly subject. Some success has been achieved in the development of strains resistant to wilts, mildews, mosaics, and other diseases. Such varieties should always be planted if they are available.

When shortage of seed forces the grower to use whatever he can obtain, there is a great risk that the seed he does procure will carry disease spores with it. Whenever the grower has the opportunity of securing certified disease-free seed he should do so even though the cost may be higher. When a good, disease-free crop has been raised by a farmer it is well worth his while to mark several of the best plants from which to save his own seed. Plants showing good growth, good cropping habit, and the characteristics of the variety should be selected during the growth of the crop and marked with stakes. When the crop reaches maturity the staked plants should be carefully looked over and the best of them finally selected for seed purposes. This practice has been followed by many of the most progressive tomato farmers in the Bowen

district for a number of years and has led to the development of the wilt-resistant types grown in that district. The same practice is followed with other vegetables by many of the leading growers throughout the North.

The fourth control method—disinfection, dusting, and spraying—must be faithfully and systematically practised at all times and throughout the life of the crop, commencing with the disinfection of the seed if certified seed cannot be secured. Subsequent treatment must be commenced in the early stages of growth of the plants and repeated at frequent intervals. Treatment must be sufficiently frequent to ensure that all the vegetative portions of the plants are coated with the spray or dust. Under the growing conditions which obtain in the North, this entails almost weekly treatment. When rain supervenes, extra treatment may be necessary. Both dusts and wet sprays are available for the control of pests and diseases, and hand or power equipment suitable for all areas from the smallest home garden to the largest farm is manufactured. Plate 126 illustrates a power-dusting machine mounted on a wooden frame attached to a tractor. This machine dusts four rows at once and will cover an acre of land in fifteen to twenty minutes. Identification of pests and diseases is carried out by officers of the Entomological and Plant Pathology Sections respectively, of the Research Division of the Department of Agriculture and Stock, and information regarding control measures is obtainable from those officers.



Plate 126.

A POWER-OPERATED FOUR-ROW DUSTER MOUNTED ON A TRACTOR.

Harvesting and Marketing.

These operations entail as much care and skill as any other item in the production programme. A visit to any market most unfortunately reveals that many farmers fail to realise the importance of presenting their product to the buyers in the best possible condition. Too often the farmer fails to reap the reward of painstaking production of a good crop through inefficient harvesting or marketing methods. The farmer who is producing at a distance from his market and has to employ rail or other transport to deliver his crops may learn much by holding back an odd case or bag of vegetables from his consignment and subjecting it

to as nearly as possible the same treatment and conditions as the consignment would probably receive. By examining the package after the period of time which the consignment should take to reach the market, some idea of the likely condition of the vegetables on being offered for sale will be obtained. With this information to guide him, the farmer can amend or improve his methods until his sample shows that the presentation of his product should be satisfactory. Actually the most satisfactory test of harvesting and marketing practices is the inspection of the consignments on the market floor, but as few growers can leave their farms in the midst of harvesting a crop to follow their consignments to market the retention of a test package will form a very useful guide.

Harvesting: The harvesting of a vegetable crop requires some skill in the selection of the individual fruits, heads, or roots, at the correct stage of maturity. Greens and root crops are most tender and palatable when young, but if they are harvested before reaching maturity they rapidly wilt and shrivel, and lose their attractive appearance. Harvesting too young also means a considerable reduction in weight of crop harvested per acre. If, on the other hand, the crops are allowed to become too mature the vegetables will be found to be tough, woody, and unpalatable. Only practice will enable a farmer to judge correctly the time when a vegetable is in the best stage for harvest.

Actual harvesting practices must be varied somewhat according to the marketing arrangements. Where a farm is situated close to the market and the vegetable is to go into early consumption, harvesting may be undertaken in the early morning whilst the crops are still moist with dew. In this condition they retain their crisp freshness for the few hours that elapse between harvesting and delivery to the customer.

If the farm is so situated in relation to the market that some time elapses between harvesting and delivery, as for instance when rail transport is involved, harvesting and packing of the vegetables in a moist condition must be avoided, because the moisture sets up heating and the rapid development of fungous diseases, which in the course of a few hours will cause the complete breakdown of the vegetables. Under these conditions harvesting must, therefore, be delayed until the moisture has evaporated from the plants. If wet harvesting cannot be avoided, as sometimes occurs in the wet belt, then the vegetables should be spread out under cover to dry before being packed. Root crops should be dug only when the soil is in such a condition that it can be easily shaken off. Washing of the roots must be avoided.

All harvesting operations must be carried out with care, as even root crops which appear hard are nevertheless capable of being bruised when roughly handled. Bruising means damaged cells and a point of entry for fungus spores, which, under the humid conditions of North Queensland, develop with great rapidity and quickly cause the decay of the whole vegetable.

Harvested crops must not be allowed to lie in the sun, but must be gathered immediately and placed under shade to avoid scalding, which will occur in a very short space of time under the hot tropical sun. If the crops are hot when harvested they should be spread to cool in the packing shed before further handling.

Grading and Packing: In preparing for packing, all deformed or damaged specimens and all those showing any insect or fungous damage must be discarded. Any tendency to retain specimens showing only small damage must be rigorously checked. The inclusion of a tomato with a small caterpillar hole in it will most probably mean a wet case on the market, with a consequent reduction in its price by possibly one-half. The place for all damaged specimens is the pig bucket or waste dump on the farm, not the cases or bags for market.

Good vegetables should be graded into their various sizes and only specimens of the one size packed into each container. Whatever type of container and whatever the vegetable, it is essential for satisfactory transport that the container be filled to the limit of their capacity. Publications on the packing of various kinds of vegetables are available on application to the Department of Agriculture, Brisbane.

Containers: The type of container to be used for some vegetable crops has been laid down in *The Fruit and Vegetables Act*, and for such vegetables the stipulated container must be used. Where no special container is specified the farmer should pack in one that will allow ample ventilation and be of such a size that it can be easily handled, and will not hold such a bulk as to damage the contents by their own weight. For example, beans should be packed in a special open mesh bag of about sugar bag size, which holds approximately 24 lb. Corn sacks are not suitable because the weave of the bag is too close to permit ventilation, and chaff bags, whilst being of sufficiently open mesh, hold too great a bulk, which may cause heating in transit. Lettuce packed in large crates damage one another by their own weight, and are also liable to heat and sweat. Damage to the heads is increased by the rough handling a heavy crate receives. Generally speaking, containers should never be heavier than can be handled by one man.

All containers must be marked clearly and legibly with the full name and address of the grower. Cases should be so branded on one end and bags should be marked on one side near the top. In addition cases should be branded on both ends and bags on both sides with the recognised shipping brand of the consignee. Ineffective marking of containers is directly responsible for considerable damage to both fruit and vegetables, because in the rush that is usually attached to unloading a number of large mixed consignments, packages poorly branded are liable to receive much turning over, probably by a number of carters, to discover the consignee's brand on them, and such handling is seldom gentle.

The Fruit and Vegetables Act stipulates that every container of vegetables must bear the full name and address of the grower in letters not less than half an inch high. It also directs that all old brands on the containers must be obliterated. Attention to these matters will ensure that the grower is credited with his produce. Failure to observe the requirements causes confusion and frequently results in the grower having to prove that a certain consignment was his before he can obtain payment for it. A stencil is the most easily applied, the most legible, and the most durable type of brand to use. Metal stencils can usually be obtained through the various farm produce agents and the agents will also supply their own shipping stencils on request.

[TO BE CONTINUED.]

PLANT PROTECTION

Diseases of the Papaw.

E. W. B. DA COSTA, Assistant Research Officer.

THE papaw, unlike most commercial species of fruit, has been cultivated on a plantation scale only within recent years and, since much of the requisite information regarding the incidence and control of disease in a tree crop can be obtained only as a result of many years of experience, much still remains to be learned about papaw diseases and particularly about their control. During the last few years, however, as a result of increased attention to the problems of papaw production in Queensland, a great deal of information on the diseases of this plant has been obtained by Departmental officers and this forms the basis of the following review of the disease position in the State.

In discussing the diseases affecting papaws in Queensland it must be remembered that for many plant diseases the most important control measure is the provision of the best practicable growing conditions, and that this applies particularly in the case of the papaw. Many of the districts in which the crop is grown on a commercial scale in Queensland are in the south-eastern part of the State and, in these districts, the papaw is near the limit of its geographic range, and the winters are generally severe enough to check the growth of the trees and to cause extensive defoliation, even in the most sheltered situations. This widespread winter injury, usually caused by cold, dry winds rather than by low temperatures, greatly increases the susceptibility of the plants to various diseases, and any cultural methods helping to maintain the trees in vigorous growth throughout the winter will materially reduce losses from disease. In addition, papaws are exceptionally sensitive to any deficiencies in soil aeration or drainage, and much loss is caused by diseases connected with adverse soil conditions.

To assist in the identification of papaw diseases a key to the more important diseases is given below. It should be emphasized that any diagnosis made by means of this key must be confirmed by reference to the more complete descriptions of symptoms given in the separate discussion of each disease. When examining diseased papaws it is essential that all parts of the tree be inspected, as some diseases which are apparently confined to the upper part of the plant are actually caused by injury to the base of the trunk or to the roots.

KEY TO PAPAWEASES.

A. Diseases affecting the plant as a whole.

Crown leaves turn brown and die and trunk dies back from tip; mature leaves may be yellow, but otherwise not immediately affected. . . **Dieback**

Older leaves turn yellow, bend down, and drop off; tree finally reduced to a bare pole with a small cluster of deformed leaves at the tip **Yellow Crinkle**

Older leaves suddenly shrivel and dry out; finally crown dies out as well; rotted areas on trunk, usually near base **Trunk Rot**

Older leaves suddenly collapse and hang limply around the trunk; crown leaves wilt and quickly die **Root Rot**

Younger leaves develop irregular, yellowish patches which dry out and die; white, powdery mould on underside of leaves, on leaf stalks, and on young fruit **Powdery Mildew**

B. Diseases chiefly affecting the fruit.

Sunken, circular, soft spots, brown to black in colour, usually lifting out readily to leave a basin shaped hole in the fruit; on ripe or ripening fruit only **Fruit Spot**

Large, black, sunken, circular lesions, on fruit of all stages **Black Spot**

Rapidly spreading, soft, watery rot with little or no discolouration, later producing masses of white or grey mould; on ripe fruit only **Rhizopus Fruit Rot**

Hard, light grey, slightly sunken, superficial scars, often extending irregularly over most of the fruit **Powdery Mildew**



Plate 127.

DIEBACK.—Early stage showing yellowing of foliage and withering of crown leaves.

A. DISEASES AFFECTING THE PLANT AS A WHOLE.**DIEBACK.**

Dieback is probably the most serious disease affecting papaws in Queensland, and it has caused very severe losses among bearing trees in some seasons. The first indication that a plant is affected by dieback is the appearance at the edge of one of the crown leaves, usually on one 3 to 6 inches across, of a light brown, water-soaked area. This area shrivels up and dies and death of the rest of the leaf and of the leaf stalk rapidly follows. At the point where the leaf stalk joins the trunk there appears a characteristic lesion, 2 to 4 inches across, at first water-soaked, then turning brown, and finally drying out to a hard, black, superficial scab. The other crown leaves turn brown and die and the trunk dies back rapidly for two feet or more from the apex. These symptoms are usually accompanied by a pronounced yellowing of the older leaves, which is commonly the first thing to attract the attention of the grower (Plate 127). The older leaves often remain on the tree for a considerable time, forming a fringe around the dead tip (Plate 128). Where large



Plate 128.

DIEBACK.—Healthy tree on left; affected tree on right, showing yellow colour of old leaves and brown decay of crown leaves.

fruit are present, they usually become shrunken, wrinkled and flabby, and finally rot. Young trees affected with this disease may die right out, but with trees bearing their second or third crop it is more usual for healthy side branches to develop rapidly after the death of the top of the main trunk. The symptoms of dieback bear some resemblance to those of certain types of trunk rot and insect injury, but it may generally be distinguished from other diseases by the browning and death of the young crown leaves before any other tissue is greatly affected, and by the hard black scab near the tip of the stem.

The occurrence of dieback is markedly sporadic and, although isolated trees may be affected by it throughout the warmer months of the year, most of the losses are experienced in severe outbreaks lasting only a few weeks. These outbreaks occur simultaneously over large areas and are apparently due to weather conditions being unusually favourable to the development of the disease. Dieback occurs in all parts of south-eastern Queensland, but the severity of its incidence varies markedly, not only as between districts but also from farm to farm in an affected district.

Although the symptoms of dieback suggested that it might be a parasitic disease of the top of the plant, investigation has shown that no parasitic organism is present in the affected top and that the death of the crown is apparently caused by some general disturbance in the health of the plant. Present information on the subject supports the view that the symptoms are produced by the failure of the roots to absorb sufficient water for the needs of the plant, this failure leading to a breakdown in the young, tender tissues of the crown. Dieback is often accompanied by a fungous rotting of the roots, but this appears to be a consequence of the weakening of the root system by adverse conditions, rather than a primary cause of root failure.

It seems that the root failure leading to dieback may be produced by a number of unfavourable environmental factors, including prolonged drought and inadequate nutrition, but that the commonest cause is deficient aeration of the soil, usually due to poor drainage. It has been observed that dieback is especially severe where there is a fairly compact subsoil close to the surface and that plantings on gravelly or stony soil are comparatively free from the disease. Also, outbreaks of dieback generally occur after periods of wet weather during which soil aeration is very poor.

Control.

Measures for the control of dieback consist essentially of the improvement of cultural conditions and of the encouragement of the recovery of affected trees. In selecting sites for papaw plantings, ground known to be badly drained should be avoided, as also should sites with a clay subsoil coming close to the surface. The physical condition of the soil should be improved by drainage, liming, and—most important of all—by the incorporation of organic matter. Where irrigation is possible, judicious use of water will do much to minimize losses from dieback, but care should be taken not to water trees too frequently, especially during the spring months.

As has been indicated, affected plants, especially those which are more than two years old, will very often recover from the disease and produce healthy side branches, and this process may be encouraged by cutting back the trunk as soon as the trouble is noticed. If small side branches are already present, the trunk should be cut back to a point about 9 inches above them; whilst, if no side branches are present, it may be preferable to cut back the trunk to 18 inches or so above ground level. If the trunk is cut through at one of the partitions, and a tin placed over the cut end, there will usually be few losses from rotting of the trunks.

YELLOW CRINKLE.

Plate 129.

YELLOW CRINKLE.—Affected tree showing yellowing and drooping of older leaves and cluster of dwarfed leaves at tip of stem.

Yellow crinkle is a very widespread disease in south-eastern Queensland and, in many districts, losses from it constitute a limiting factor in the commercial life of a plantation. Usually the first noticeable symptom is a pronounced yellowing of the old leaves, the stalks of which bend down slightly where they join the trunk, as shown in Plate 129. Finally these older leaves dry out and drop off leaving only a small tuft of crown leaves on the tree. In the younger leaves, transparent areas develop between the leaf veins, and finally drop out, giving an irregular "shot-hole" appearance to the leaf. These leaves also turn yellow, curl in from the margins, and become claw-like in appearance, before dropping off. In the very young crown leaves, the leaf blade may be greatly reduced, often to an extremely small fringe around the leaf stalk (Plate 130). The flowers are also affected, coarse, green, leaf-like structures being produced in place of the female flowers. Young fruit are shed in the early stages of the disease, but fruit of appreciable size usually remain on the tree, and often exude a pink gummy substance. Finally the tree becomes a bare pole with a cluster of very small, deformed leaves at the top, and possibly a few

large fruit, and may remain more or less in this condition for months or years, making no growth and eventually dying.

Although yellow crinkle may occur in trees of all ages, young trees which have not yet flowered are only rarely affected. In branched trees, only one of the branches, most frequently the uppermost, is normally affected in the first place, the spread of the disease to the other branches being often slow and irregular. Yellow crinkle develops chiefly during the summer months and appears to spread most rapidly in periods of hot, dry weather. It occurs in all papaw-growing districts and on practically every farm, and there seems to be no specific connection between the district and the importance of the trouble.

The exact nature of this disease has not yet been determined. The symptoms and the scattered mode of occurrence, however, strongly suggest that it is a virus disease, although so far no direct proof of this by artificial transmission to healthy trees has been obtained. Owing

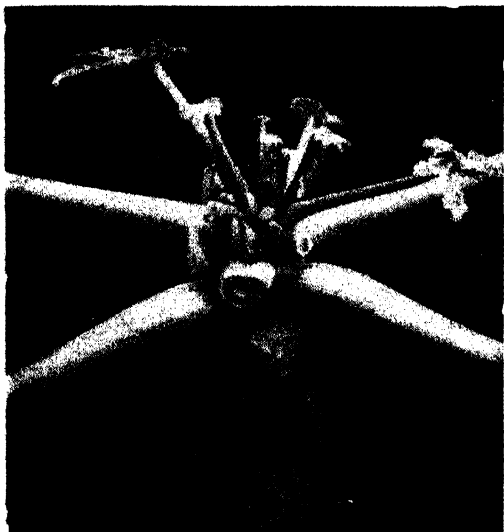


Plate 130.

YELLOW CRINKLE.—Close-up of affected tip of stem of tree in Plate 3 showing dwarfed crown leaves.



Plate 131.

TRUNK ROT.—Trunk of affected tree, with strip of bark removed to show soft, wet rot beneath.

to the serious effects of yellow crinkle, it is advisable to treat it as a transmissible virus disease, and the measures recommended for its control are based on this assumption.

Control.

The control of yellow crinkle involves the prompt and thorough eradication of all affected trees. These will not yield any further crop and there is a distinct possibility that the disease will spread from them to healthy trees. Also, any abandoned plantings should be cut down, because neglected trees will serve as a reservoir of infection from which this and other diseases may spread to younger plantings, even where these are a considerable distance away.

TRUNK ROT.

The soft, fleshy stem of the papaw is very subject to fungous rots, which may be so severe as to cause the death of the plant. In mild cases, the main symptom is an unthrifty development of the top of the plant, accompanied by shedding of the older leaves and often of the young fruit. If the trunk is examined, it will be found that a portion of it, usually several feet from the ground, is affected with a dry, dark rot, frequently penetrating to the central cavity of the stem. In another, more severe, type of rot, the older leaves shrivel up and dry out very suddenly and this may be accompanied by wilting of the crown leaves followed by the death of the plant. In such a case, an examination of the trunk discloses a soft, wet rot beneath the almost intact bark, usually just above ground level (Plate 131).

Trunk rot is caused by a number of different fungi*,

* Including *Ascochyta caricac* and *Pythium* spp.

which usually gain entrance at weak points, such as cultivation injuries to the base of the tree or through the point of attachment of dead leaves or rotting fruit. In young plants, injury due to sun scald may provide a suitable region for the entry of the fungus. However, the primary cause of the disease is to be found in the lessening of the resistance of the plant to infection induced by adverse growing conditions, such as poor drainage or imperfect nutrition.

Control.

An improvement in the general health of the plant by suitable cultural methods is the best way in which to control trunk rot. The physical condition of the soil should be improved by drainage and by the incorporation of organic matter, and the trees should receive adequate supplies of nutrients, particularly of potash. In addition, care should be taken to avoid injury to the bases of the trunks of the trees during cultivation operations.

Where only a small portion of the trunk is affected, it may be possible to arrest the spread of the trouble by cutting out the diseased tissue and painting the cut surface with Bordeaux paste or Stockholm tar. If the rot occurs in the upper part of the tree it may be advisable to cut back the trunk to several inches below the affected area in order to encourage the development of healthy side branches.

ROOT ROT.

Papaws require an exceptionally well-drained and well-aerated soil for healthy growth, and consequently in most Queensland producing areas the majority of the trees exhibit some degree of root rotting. It is only in a few situations, however, that this is sufficiently extensive to cause any noticeable damage to the plants. The characteristic symptom of root rot is that the older leaves suddenly collapse and hang limply around the trunk and the younger crown leaves wilt and quickly succumb. Usually the whole plant dies within a few days of the appearance of the first external symptoms.

Root rot is caused by a variety of soil-inhabiting fungi*, but primarily the trouble is brought about by an unsatisfactory physical condition of the soil. The disease is commonly associated with deficiencies in drainage and often occurs in restricted patches in low-lying parts of the plantation. It is much more prevalent after heavy rains than at other times. The damage is most serious among young seedlings, but older trees may occasionally be affected, especially during wet seasons.

Control.

The control of root rot depends largely on soil improvement by measures similar to those advocated for the control of dieback. Sanitation is also important, and all affected seedlings should be dug out and burned, after which replanting in the same hole should be avoided, if possible, or at least delayed for some time.

* Including *Pythium* spp. and *Fusarium* spp.

POWDERY MILDEW.

Powdery mildew is a fungous disease which causes losses to the grower in two distinct ways; firstly, by injuring plants of all ages and by killing young seedlings during the winter months, and, secondly, by causing surface blemishes on the ripe fruit. Numerous small, water-soaked dots about one-sixteenth of an inch in diameter develop on the underside of the leaves, and, under moist conditions, these water-soaked areas become covered with a white, powdery fungous growth. The areas on which this fungus grows develop into irregular, yellowish patches, $\frac{1}{2}$ inch to 3 inches across, which constitute the first conspicuous symptom of the disease. These patches rapidly turn brown and dry out, giving the leaf a scorched appearance. In severe infections, almost all the young leaves may be destroyed and, in the case of seedlings, this often results in the death of the plant. The white, powdery fungus may also develop abundantly on the young fruit, where it forms spreading, circular, white patches, which may coalesce so as to cover most of the fruit surface (Plate 132). As the fruit develops, the mould disappears, but it leaves a hard, light grey scar on the surface, and the growth of the underlying tissues is checked, causing a malformation of the mature fruit (Plate 133). On ripe papaws the hard, grey, irregular, slightly-sunken scar is still conspicuous, and the appearance of the fruit is spoiled. The eating qualities of attacked fruit are usually unimpaired, although occasionally the flesh is harder and drier than is normally the case.



Plate 132.

POWDERY MILDEW.—Young fruit showing patches of white powdery fungus.



Plate 133.

POWDERY MILDEW.—Full-grown fruit showing irregular grey scars and malformation caused by early infection.

Powdery mildew is caused by a fungus*, which grows almost entirely on the surface of its host plant, producing the white, powdery mould referred to above. As the development of the fungus is favoured by high humidities and relatively cool weather, the disease is most severe in sheltered situations or where the trees are very closely planted. The fungus is most active during the winter months, but fruit harvested in mid-summer may show scars due to attacks of the disease in the early stages of its development.

Control.

Owing to the superficial nature of the infection, powdery mildew may readily be controlled by the use of a sulphur fungicide. Dusting is usually more convenient than spraying, and either dusting sulphur or a mixture of dusting sulphur and hydrated lime is used; where a wet spray is preferred, colloidal sulphur, wettable sulphur, or lime sulphur will prove effective. Applications should be made at intervals of 3 to 4 weeks from late May to October, care being taken to ensure that the spray covers the young fruit and the underside of the young grown leaves.

B. DISEASES CHIEFLY AFFECTING THE FRUIT.

FRUIT SPOT.

Fruit spot, or ripe rot, is the term usually applied to a type of shallow, fungous rotting of ripe papaws, which causes severe losses in harvested fruit, especially in those consigned to southern markets. The spots first appear as irregular, brown, superficial discolourations of the skin, from $\frac{1}{8}$ inch to $\frac{1}{2}$ inch across. These develop into circular spots, $\frac{1}{2}$ inch to 2 inches in diameter, with a sunken surface. The surface colour varies from the normal skin colour through various shades of brown to charcoal-black; under moist conditions some spots may develop a salmon-pink incrustation of spores over most of their surface.

The affected flesh is rather dry and, although it may sometimes show irregular greenish-black areas, there is usually little discolouration. With most of these spots, the affected portion of the flesh may readily be lifted out, leaving a basin-shaped hole in the fruit. Fruit spots tend to occur in groups on the upper side of the fruit, and, in advanced stages, these may coalesce until a large part of the fruit surface is affected (Plate 134).



Plate 134.

FRUIT SPOT.—Showing numerous shallow, sunken lesions on ripe fruit.

* *Sphaerotheca* sp.

Fruit spot normally occurs only on ripe or partially ripe fruit, and, whilst it is fairly common in the field, the great majority of the spots develop only after the fruit is harvested, especially on fruit destined for the more distant markets, which is necessarily picked at an early stage of ripening. The seasonal incidence of fruit spot varies with climatic conditions, but usually losses are most severe in early spring and diminish as the season advances. The disease occurs wherever papaws are grown and its importance varies from time to time rather than from district to district.

Fruit spot may be caused by any one of a number of different fungi*, but, no matter which one is responsible for the trouble, the lesions caused are very similar, as are the modes of infection and the control measures to be adopted. All of these fungi are present in large numbers on decaying leaves and leaf stalks, and it is chiefly from these that the infection spreads to the fruit, particularly during wet weather. Some of the fungi concerned are capable of producing latent infection, in which the fungus enters the young fruit but remains dormant just below the surface until the ripening of the fruit produces conditions favourable to the rapid development of the organism. Thus most of the fruit spot occurring in September and October represents the final phase of development from infections which took place during the rainy season of February and March, and this makes control of the disease very difficult.

There appears to be a marked variation in the inherent susceptibility of different strains of papaws to fruit spotting, and this variation may be connected with differences in the duration of the final stages of the ripening process. In addition environmental factors have a strong influence on the incidence of the disease. Where the fruit has been exposed to sun and wind, as by the loss of most of the older leaves of the tree through winter injury, the upper part of the fruit often develops "scald." This is a dark brown, "varnished" appearance of the surface accompanied by premature ripening, and, as the fruit ripens, the "scalded" area develops numerous fruit spot lesions. The development of fruit spot in packed fruit in transit is favoured by high temperatures and by lack of ventilation.

Control.

Complete control of fruit spot is very difficult to obtain, but losses may be minimized by the adoption of the following control measures. All rotting fruit and as many dead leaf stalks as possible should be removed from the trees and destroyed. Exposure of the fruit should be minimized by planting in sheltered situations and by maintaining the trees in vigorous growth during the winter months. When selecting trees for seed purposes, their susceptibility to fruit spot should be taken into consideration. When harvesting, the fruit should be picked as ripe as possible, having regard to its destination, and fruit should be kept cool and well ventilated in storage and transport.

* Including *Gloeosporium* spp., *Ascochyta caricae* and *Phomopsis* spp.

Should these measures fail to reduce losses from fruit spot sufficiently, the application of a protective copper fungicide to the developing fruit may be adopted. Owing to the long period over which infection may take place and to the rapid development of papaw fruit during the summer months, it is not practicable to obtain complete control by this means, but the spray schedule recommended will eliminate all but a small proportion of the fruit spots. The spray used should be home-made cuprous oxide mixture, or a suitable proprietary substitute, at a strength of .1% copper, which is equivalent to a 2-2-40 Bordeaux mixture; Bordeaux mixture itself should not be used on papaws as it may cause serious injury to the young crown leaves. The addition of potash soft soap, at the rate of 2 lb. to 40 gallons of spray, or of a proprietary spreader, may be necessary to obtain a good cover on the waxy surface of the young fruit. The spray should be applied at intervals of three weeks from early January to late April, and again at monthly intervals from early August to October. In spraying for fruit spot control it is essential to keep the young fruit covered from the time of setting; if this is done, effective control may be obtained without having to cover the leaves or the trunk.

BLACK SPOT.

Although black spot is not a disease of major importance, it may occasionally cause severe losses of immature fruit on individual trees throughout the plantation. The first symptom of the disease is the appearance of a small, brown, water-soaked spot, which develops into a sunken, black, circular lesion, from 1 inch to 3 inches in diameter; young fruit, when attacked, may wither and drop off, especially if infected near the stem end (Plate 135). Although fruit may be attacked at any stage of its development, the most extensive losses occur in fruit one or two inches long.

The causal agent* of black spot is one of the fungi which are responsible for trunk rot. The fungus usually gains entrance to the fruit either at the point of attachment or where the fruit is in contact with a dead leaf stalk or with another fruit. This disease is especially common on trees which have produced a densely-crowded crop of small fruit. Black spot occurs in all parts of south-eastern Queensland, losses being most severe during winter and early spring.

* *Ascochyta caricacae*.



Plate 135.

BLACK SPOT.—Showing young fruit infected at point of attachment to stem.

Control.

Where the trees are maintained in vigorous growth, black spot rarely causes any serious loss. Its incidence may be reduced by removing dead leaf stalks and rotting fruit, and by thinning out overcrowded fruit as soon after fruit-setting as possible. Should losses from black spot become serious, effective control may be obtained by the application, at monthly intervals from May to October, of a protective copper fungicide of the type recommended for fruit spot control.

RHIZOPUS FRUIT ROT.

Rhizopus fruit rot starts as a small, water-soaked spot and spreads very rapidly until the greater part of the fruit is involved in a soft, watery rot, with little or no discolouration. In advanced stages, strands of a coarse, white or grey mould may cover the surface of the fruit (Plate 136). Usually only ripe, harvested fruit is affected, losses being heaviest during the summer months.

The rot is caused by a fungus* which is very common on rotting fruit and on dirty cases and equipment. Infection usually takes place through injuries of some type, old fruit spot lesions being a common point of entry.

Control.

Rhizopus rot may be effectively controlled by strict attention to sanitation and by careful handling. The packing shed, picking baskets, and cases must be kept clean and free from rotting fruit, and fruit should be handled carefully to avoid injury. Injured or spotted fruit should not be consigned for any long distance, and all packed fruit should be kept cool and well ventilated in transit.



Plate 136.

RHIZOPUS FRUIT ROT.—Showing thick growth of fungus on soft, water-soaked, affected area.

* *Rhizopus nigricans*.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.



Lessons from Herd Testing.

L. ANDERSEN, Dairy Instructor.

IN the pioneering phase of the dairying industry in Queensland, such matters as the establishment of the farm and its improvement, the provision of habitable living quarters for the settler and so on, were necessarily given priority over herd improvement. This still applies in some more recently opened dairying districts, but in the older settled areas the stage has now been reached when the industry is becoming of a more intensive character, with the necessity for a changing outlook on stock improvement. The quality of a dairy herd, as measured by productive ability rather than numbers must henceforth be given the attention it deservedly merits. The main factors in any progressive policy of herd improvement are:—

- (a) Testing for milk and/or butterfat yield of all cows,
- (b) Culling of unprofitable cows;
- (c) Use of superior bulls capable of raising herd yields.

While the necessity for using a pure-bred sire to head the dairy herd is now recognised by most dairymen, there is still insufficient appreciation of the fact that only bulls with a production background can bring about any marked general uplift in production levels. Constructive herd improvement depends primarily on the influence of the bull; the old adage "The sire is half the herd" is a truism. The only true test of a bull is a comparison of the production of his daughters with their dams. Until herd testing is widespread it will be impossible to determine which bulls are capable of transmitting high productive capacity and to ensure a sufficient number of them to effect improvement generally in herds.

In Denmark.

Herd testing is practised in all countries with an organised dairying industry, but its full national value in the elevation of the quality of the dairy stock of a country has been mainly recognised in Denmark and New Zealand. As a result of an intensive campaign conducted over a period of forty years in Denmark, the average production per cow in that country has been built up to a figure far in excess of that of any other country. No doubt the war has, for the time being, put

an end to all this progressive work in Denmark, but annual reports of pre-war years indicated that up to 650,000 cows, representing as much as 40 per cent. of the aggregate cow population, were tested annually. At the beginning of the Danish testing campaign, the average production per cow was about the same as the existent average production in Queensland, but through patient and continuous application of the lessons to be learned from herd testing, the Danish farmers before the German occupation of their country could boast of an average of more than 300 lb. of butterfat per cow. While this excellent average for the herds of the whole country had been attained, some provinces had accomplished even better results. It is reported that on the island of Funen, 100,000 cows under test had a record of 375 lb. of butterfat per cow. Not only had the average fat yield been increased, but by constant culling and selection, the average fat content of the milk of Danish cows had been increased from 3.3 to 3.9 per cent.; many owners had a herd fat test of nearly 5 per cent.

In New Zealand.

In recent years, New Zealand farmers have tackled with determination the problem of herd improvement by the application of testing results. One association, for instance, which commenced operations in 1924 with 630 herds, comprising 31,000 cows, with an average yield of 207 lb. per cow, had, in a period of 10 years, increased the number of cows under test to 62,300, with an average yield of 255 lb. of butterfat per cow. That the farmers realise the value of this service is reflected in their willingness to pay for the cost of the recording work at the rate of 5s. per cow. Before the war approximately 300,000 cows were tested annually in New Zealand.

In Australia.—Victoria.

In Australia, Victoria has led the way in herd recording, approximately 100,000 cows having been tested in one year. The growth and influence of the movement in that State has resulted in its average production per cow being lifted considerably above that of the other Australian States. In 1939-40 the Victorian average production per cow was 533 gallons, the Australian average 390 gallons, and that of Queensland 322 gallons. Some figures available for Gippsland, one of the leading dairying districts of Victoria, show that in the first year of testing operations in that district, eight associations were formed, and the average butterfat production per cow was computed as 179 lb. Following the application of regular testing, the average cow production was lifted to 268 lb. in a period of five years—an increase of 50 per cent. Many owners in Victoria have brought their average up to more than 400 lb. of butterfat per cow.

In Queensland.

Because of the industry being still largely in the developmental stage, herd testing associations have not been formed in Queensland. The State Government has, however, provided a grade herd testing scheme which is entirely free of cost to the farmer. Many farmers have taken advantage of this scheme, at one time upwards of 30,000 cows being tested, and one herd at least has been tested for fifteen years continuously. Much good work has been done towards

the improvement of the herds of farmers who have consistently tested under the scheme. Testing itself cannot alone improve production. However, the intelligent use of the test records in the culling of cows and selection of breeding stock and replacements, coupled with the use of successive sires capable of raising the productive capacity of the herd, can play a most constructive role in herd improvement. Until such time as herd testing is carried out continuously and systematically by Queensland dairy farmers, the average production per cow will not be likely to show any appreciable improvement. Highly productive herds, which have been built up by the use of testing results will, too, soon tend to a regression to the average of the breed, unless herd testing is continuously followed in order to enable corrective measures to be taken against such deterioration.

A Well-managed Herd.

The rapid headway possible in a well-managed herd, in which testing forms the basis of management, is well illustrated in the case of one Queensland herd. The owner of this herd was probably in better financial circumstances than the average dairyman; his herd, which included a fair proportion of pure-bred stock, was of fair conformation; feeding methods were better than average; and production was above the average for the State. Nevertheless the farmer was not satisfied with the herd yields, and in 1938 decided to submit the whole herd of approximately 45 cows for testing. The records compiled at the completion of the first year's testing showed an average production of 183 lb. of butterfat per cow. Many of the cows which were found to be low producers, were eliminated in due course. In the intervening period of six years since testing was commenced this farmer has never missed submitting all cows for testing at each two-monthly testing periods. The herd average has now been increased to 250 lb. butterfat per cow, while the highest producer has given over 400 lb. of butterfat. The increase of 36 per cent. in butterfat yield per cow has well rewarded the efforts made. Certainly feeding methods, as well as breeding, have been improved on this property, but the objective of herd testing is to show, and to enable the farmer to put into effect, all those factors in herd management which lead to improved production. Assuming butterfat to be worth 1s. 6d. per lb., the monetary returns for 1938 and 1943 respectively on this farm would be:

1938: 45 cows produced 8,235 lb. butterfat valued at £617

1943: " " " 11,250 " " " " £843

Increased value of produce £226

The accomplishment on this farm which at the start of systematic herd testing had a herd well above average production shows what further improvement would be possible in a low-producing herd.

Although the season just passed through has been exceptionally favourable for dairying, testing returns of new herds submitted in the grade testing scheme indicate plainly that many cows being milked are such low producers as to be totally unprofitable in any herd, regardless of the price of butter.

Machine-milked Herds.

The widespread use of milking machines, which will no doubt continue with even greater impetus, may be regarded as a factor tending to militate against increased herd testing. In reality, testing becomes even more important in machine-milked herds. As many owners who have installed milking machines have already discovered, it is quite impossible to make any estimation of the value of any particular animal in such herds unless herd testing is practised. Resorting to hand milking of the whole herd for sampling the milk for testing purposes may be difficult for many farmers, but the difficulty can be overcome by the use of testing buckets, which are available from the manufacturers of most milking machines. The taking of samples from one portion of the herd on two successive days and the remainder on succeeding days overcomes the difficulty which may be associated with taking samples in large herds.

Testing a Free Service to Dairy Farmers.

As pointed out earlier, the grade herd recording scheme operated by the Department of Agriculture and Stock is free of cost to the farmer, all that is required of the farmer being the taking of the samples at intervals of eight weeks in the course of the lactation period. The butterfat testing and all calculations are made by the herd testing section of the Dairy ranch, and at the end of the lactation period a return showing the individual production of each member of the herd is prepared and sent to the farmer. Information concerning this scheme, together with the necessary application forms, is obtainable from any dairy officer, or by writing direct to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Cream Can.

D. S. ROBERTSON.

TOO often the cream can is regarded as an innocent container for containing cream from the farm to the factory, and because of this, only scant attention is given to the care and cleaning of it. The can is certainly a container for the conveyance of cream, but it is not a very satisfactory one unless properly cleaned and handled. Unclean cream or "metallic" cream on delivery at a factory can often be traced to dirty cans, or cans in need of retinning; and this despite the fact that scrupulous care has been taken in keeping other utensils and milking machines clean, and by practising correct dairy methods in the milking shed.

To obtain the utmost satisfaction from a cream can, three things should be remembered:—

1. The can was made to hold cream and not waste wash-up water, disinfectant solutions, meat, and other things.
2. The can was made to be kept scrupulously clean.
3. The can was tinned during manufacture, and this tinning was meant to be replaced when worn off.

To clean cans and keep them clean, the most necessary thing is plenty of boiling water. The can should be scrubbed both inside and out with hot water containing some cleaning mixture, and then thoroughly sterilized with live steam, or, if steaming is impracticable, thoroughly scalded in boiling water. The can should then be inverted on the draining rack to drain and cool. Only when completely cooled off should the can be used for holding cream. No difficulty will be found in cleaning the cans if they are used for cream only, and plenty of boiling water is available.

Dairy officers regularly check the cans at the butter factory, and where found to be rusted and pitted, issue orders for their retinning. Apart from the fact that it is a breach of the *Dairy Produce Acts* to use such a can until the inspector's orders are complied with, the farmer should realise that, in his own interests, the can should be retinned, as the use of rusty cans can only lead to one result, a second grade, metallic flavoured cream.

Wear on cans is hastened if carelessly handled. For no reason should cans be thrown on the ground from the floors of cream wagons: nor should cans be stacked on a box in the sun at the dairy, to be blown on to the ground with the force of a stiff breeze. A clean, well-kept can with a polished name plate reflects credit on its owner as evidence of efficient dairy farming.

The responsibility of cleaning and caring for cream cans does not however, rest solely on the farmer. The butter factory also has a lot to do with it, and no matter how much care and attention is given to the cleaning of the can on the farm, poor management or faulty washing technique can undo all the farmer's efforts. Cans are frequently returned from the factory which, when the lids are removed, are found to contain small amounts of putrid smelling water. Apart from the fact that this is quite reprehensible and only adds additional work to the cleaning of the can on the farm, it also causes a feeling of dissatisfaction on the part of the farmer, who feels that the factory is not giving him the service to which he is justly entitled. Obviously, it reflects discredit on the factory management. The return of cans to the dairy in the condition described may be traced to four causes:—

1. The water in the can washer not being hot enough.
2. Banging the cans through being in a hurry, and not allowing long enough time over the steamer.
3. Using the same water in the can washer from day to day without changing it.
4. Jamming the lids down on cans immediately they are removed from the steamer.

To obtain the best results, the water in the can washer should always be very hot, and should be changed regularly. In addition, adding an alkali, such as soda ash, to the water in the washer will help to remove any deposits in the can more effectively than water without soda. After draining the washer, the reservoir should be hosed out with boiling water and the tray removed to drain.

Although very spectacular to watch, the process of racing cans through the washer is not a very efficient way of cleaning them, as each can requires at least fifteen seconds over the steamer. After removal from the washing machine, the cans should be stored with the lids off and allowed to cool. Jamming lids down on cans as soon as they are removed from the washer causes a foul smell, which is exceedingly difficult to overcome. The same care in handling applies to cans at the factory as well as cans at the dairy. Rolling cans across the floor, piling cans in heaps, or cheerfully tossing them up on the top of the racks is not likely to prolong the life of the can. The factory management can, therefore, do much to promote co-operation between itself and farmer by setting an example in always returning cans in a clean, sweet-smelling state, free from dents and other damage.

MILKING SHED HYGIENE.

It is a requirement under the Dairy Regulations for water and cloths to be used for the washing of udders and near parts of cows before commencing to milk. This, if done carefully, is a definite aid in reducing bacterial contamination from dust, hairs and manure particles which may fall into the milk bucket. It is, however, sometimes observed in the course of farm instructional visits that a tin of water is left standing after use in the bails to be used again during the next milking period. The soiled wash-cloths, too, are sometimes allowed to remain in the dirty water from one milking period to another. Such practices carry their own condemnation, for they not only nullify the advantage of washing udders, but add greatly to the bacterial contamination which their use, in the first place, was designed to avoid. So it would be better to neglect washing altogether than to use dirty water and dirty cloths.

After each milking period at least, clean cloths and water should be used. In fact the water should be changed as often as it becomes dirty during milking time. The cloths should be rinsed and wrung out, and changed, too, if they have become soiled; they should be boiled after each milking and hung to dry in a place protected from cowyard dust, yet in the sterilizing rays of the sun. A few Condy's crystals or a little of a chlorine compound added to udder wash waters would be an advantage.

—E. B. RICE.

THE COUNTRYMAN'S SESSION

Sunday Morning Radio Service to Farmers

(By arrangement with the Australian Broadcasting Commission)

Farmers are recommended to tune in to either a
Queensland National or Regional Station.

EVERY SUNDAY AT 8.30 a.m.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of Australian Illawarra Shorthorn and Jersey Societies. Production records for which have been compiled during the month of March, 1944 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS				
SENIOR, 4 YEARS (STANDARD, 330 LB.)				
Braemar Lovely	W. Henschell, Yarranlea	9,680 62	336 43	Blacklands Gay Lad
JUNIOR, 3 YEARS (STANDARD, 270 LB.)				
Glen Idol Florrie 5th	P. Doherty Estate, Gympie	9,077 2	352 987	Blacklands Count
Rosenthal Dove 24th	S. Mitchell, Warwick	7,956 21	330 356	Rosenthal Perfection
JUNIOR, 2 YEARS (STANDARD, 230 LB.)				
Yarranvale Empress	W. Henschell, Yarranlea	8,809 4	332 853	Trevor Hill Bosca
Yarranvale Belle	W. Henschell, Yarranlea	7,729 76	303 171	Trevor Hill Bosca
Yarranvale Milkmaid	W. Henschell, Yarranlea	7,145 66	275 467	Trevor Hill Bosca
JERSEY.				
SENIOR, 3 YEARS (STANDARD, 290 LB.)				
River View Speedwell's Dove	J. T. Richardson, Oakwood	5 267 65	313 021	Rosdale Speedwell's Fox
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Bellgarth Falcons 2nd	R. Patterson, Lavelle, Milmeran	6,100 96	328 678	Carnation Ivy's Victory
JUNIOR, 2 YEARS (STANDARD, 230 LB.)				
Woodview Joybell	P. H. Schull, Oakley	4,300 25	254 007	Lermont Victory
Ashview Silvermine	C. Huey, Sabine	4,852 9	231 825	Treacme Victor 4th



A Farrowing Race or Crate for Brood Sows.

E. J. SHELTON.

IT has been customary for many years for pig raisers to provide farrowing rails around the sides and back of the pen in which the sow farrows. This rail 9 inches from the wall and 7 inches from the floor provide a risk-free area into which only the piglets can go when the sow lies down. Doubtless such farrowing rails have been the means of saving many hundreds of young pigs. Even a better and more dependable arrangement is the provision of a farrowing race or crate within the sty itself.

This crate is built of strong timber, is 2 feet 3 inches wide, at floor level (the same or narrower at the open top), is 5 feet long, 3 feet high, and either has its own floor or is placed on top of the floor of the sty. The lower side rail of 10 inches by 1 inch pine or hardwood is placed 10 to 12 inches above ground or floor level. Two such side boards should suffice a 12-inch space between each board would be satisfactory. That part of the front of the crate where the sow's head would lie is closed in and at the rear there are wooden slots into which the slip-in door giving entrance to or exit from the crate is placed.

A suitable floor area for the sty would be 10 feet frontage, 8 feet from front to back wall with roof at least 6 feet above floor level. There should be doors giving entrance and exit from this sty. A long narrow sty may be preferable to a short, wide one. Short straw bedding should be provided in which the young pigs can snuggle and sleep.

The objective of this equipment is to have the sow accustomed to being locked in for a few hours each day for several days before she farrows. She should be released early in the morning—except on farrowing day when no feed should be given—and be locked in during portion of the day and night. This accustoms her to the routine and the surroundings. Sows so enclosed have ample room to stand up and lie down, but not to turn round. When the young pigs are born there is ample room for them to keep clear of the sow.

As farrowing time approaches, a warm bran mash should be given with the addition of 4 fluid ounces of castor oil or liquid paraffin, two or three days before the farrowing date; this with exercise each day and plenty of succulent green food should result in satisfactory farrowing. The food should be strictly limited at this time. The crate and sty should be kept scrupulously clean and dry.

Marketing of Pigs.

E. J. SHELTON.

THE marketing of pigs in a mud covered, lice-infested or otherwise unclean condition is bad business, although it is not always practicable to have the animals "spic and span" on arrival by rail at factories and works. It is a decided advantage to keep the animals under cover for a few days before despatch and to hose or wash them to free the skin of mud. Treatment for lice is worth while, too, seeing that these parasites are readily transmitted from one animal to another and hide in crevices of sty walls, trucks, crate or other conveyance.

Where it is possible to hose or hand-wash the animals an hour or two before submitting to auction and to allow them to dry in the sunshine shillings per head may be added to their auction value at little extra expense.

The indication of lice infestation in pigs is the white "nits" or eggs of the common hog louse, which will be noticed adhering to hair in protected parts of the body.

It is wise marketing, too, to grade or arrange for grading into suitable age, size, or condition groups, for the pigs then sell to better advantage and give greater satisfaction to purchaser. Care should be taken to avoid offering for sale any animal manifestly in ill health or about whose condition there is some doubt; it is preferable to hold these animals on the farm and to treat them as may be required, so that they may be restored to health before going before buyers or to the factory.

Trucking of large and small pigs in separate compartments and keeping calves separate from pigs is in the interests of all concerned. Every animal offered for sale, barter or exchange should be legibly branded before sale in order to comply with legal requirements.

Special care should also be taken to see that suitable advice notes respecting the animals included in consignments reach the auctioneer or factory manager in ample time before the expected arrival of the stock. Care thus taken ensures confidence, and confidence ensures success.

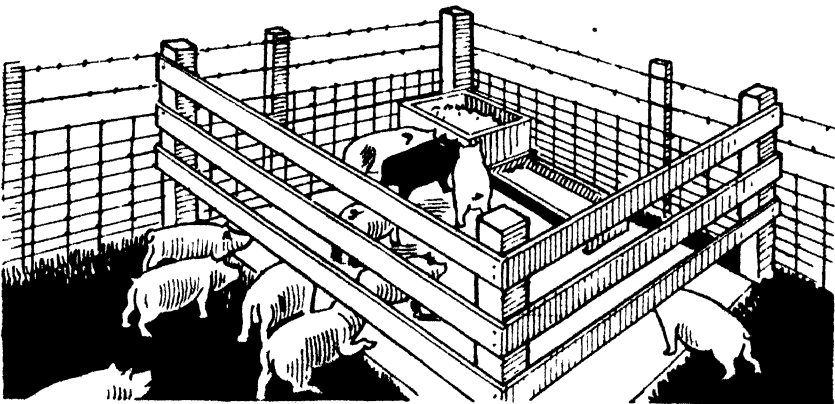


Plate 137.

MANY SUCCESSFUL PIG RAISERS FIND THAT THE CREEP SYSTEM OF FEEDING, HERE ILLUSTRATED, RESULTS IN RAPID WEIGHT GAINS BY YOUNG STOCK.

RESTING STOCK BEFORE SLAUGHTER.

The importance of resting stock, pigs in particular, before slaughter, cannot be stressed too strongly.

Much loss is incurred annually through partial and total condemnation of carcasses at slaughterhouses and bacon factories for bruised and fevered conditions resulting from the slaughter of animals too early after their arrival.

Sometimes in the yarding of pigs, batons, whips or sticks are used, and a troublesome pig may receive quite a few hits before it is actually penned. Pigs are often fat and soft, and are therefore easily bruised. Very severe bruising, too, may be caused behind the jaws and the shoulders of pigs as a result of their having their heads jammed when they are being drafted into various pens. In such cases as these where the pigs are slaughtered almost immediately the slaughtering inspector may find it necessary to remove large areas of bruised flesh from the carcass, and may have to remove the head and, perhaps, cut up high into the neck, almost to the shoulder.

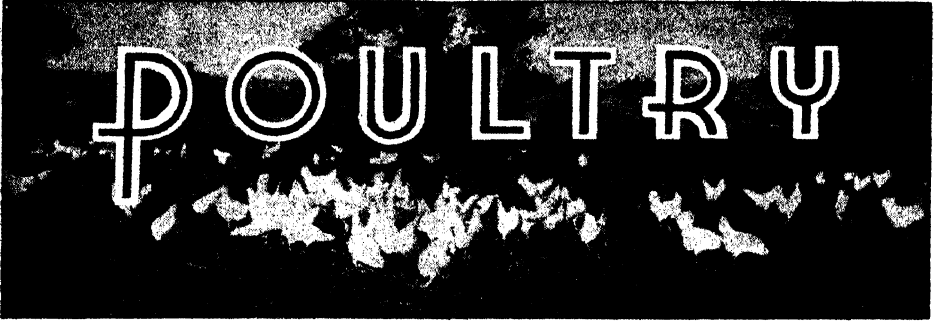
Practically all such partial condemnations of pigs would be avoided if the owners made provision for spelling animals a few days before slaughter, so that any bruising which may have occurred shall have time to absorb.

There are occasions of course, when due to fractured limbs, partial paralysis and similar causes immediate slaughter is desirable, but in such cases some loss is unavoidable, nevertheless much of it is preventable by the exercising of more care in the handling of stock en route from farm to slaughter floor.

It is particularly desirable that stock should be well rested and should undergo a temporary fast before slaughter in order that the animal will "kill out" to advantage. The provision of suitable equipment for unloading pigs from farmers' waggons and trucks to prevent "dumping" them onto the ground, a distance of anything up to three feet, and much greater care in mustering and final loading should be evident to everybody associated with the marketing of this class of stock. Every effort should be made to avoid overloading waggons, to separating large sows and stags from baconers and porkers, and to see that the animals are not overheated or partly exhausted before loading.

FEEDING CEREAL MEAL TO PIGS.

In the preparation of bacon pigs, from weaning to slaughtering age, an average of just over 4 lb. of cereal meal per pound of live weight gain is necessary. In some overseas tests in individual herds the amount of meal required to produce 1 lb. live weight of bacon pigs ranged from 3.81 lb. to 4.56 lb., this range representing a difference of one hundred-weight of meal or a cash difference of approximately 8s. in the production of a 200 lb. bacon pig.



Incubation.

P. RUMBALL.

Part 2.

THERE are many reliable makes of incubators on the market which are sold with instructions for working. These instructions should be followed by the operator, as they are prepared after tests made by the manufacturer. There are, however, features which apply in a general way to most makes.

The incubator should be set up in a room in which there is little variation, if any, in temperature. If a special room has to be built it should have two roofs with a space of 6 inches to 1 foot between each. The outer roof should overhang several feet on all sides. Such a roof permits of free circulation of air between them and prevents an undue increase in room temperature by the rays of the sun when overhead; the overhang protects the walls. If it is found that late in the spring the overhang is insufficient protection from the afternoon sun, a curtain may be suspended to afford greater protection.

Ventilation should be provided by windows and adjustable vents in the inner roof and bottom of the walls, to be adjusted according to the number of machines in the room and outside temperatures. Direct draughts, however, should be avoided. Where it is not desired to go to the expense of building a special incubator-room, an enclosure may be made under most dwelling-houses. When the incubators are so situated it is essential that the insurance people concerned be notified.

Heating of Incubators.

Many incubators are heated with kerosene lamps. The lamps should be thoroughly cleaned daily and the burner boiled in water, to which washing soda has been added, after each hatch. If a large flame is used when first warming up the machine, it frequently leads to smoking of the lamp. A good grade oil is essential, and in adjusting the flame, it should be turned up a little higher than necessary and then reduced to the desired height. This action makes the last pull on the wick down and guards against a flame running up. Wicks of a correct size should be used.

The lamp should be cleaned and filled early in the afternoon. By doing this at this period, all char is removed thus ensuring the maximum heat from a given-sized flame during the night, and at the same time providing for ample time to make the correct adjustments. In trimming the wick the charred crust may be rubbed off with a wooden match.

Beginning the Hatch.

The machine should be heated about two days before the eggs are set, and when it is well warmed up adjustment of the regulator should be commenced. When the operator is sure that the regulation is correct, the eggs may then be set. It is better to do this in the morning than later in the day so that the eggs may be completely warmed up before nightfall. It is too much to expect of the heating capacity of any machine to warm up cold eggs and maintain the right temperature during a cold night. When eggs are placed in an incubator, the temperature of the interior naturally falls. After a while, the regulator may be lifting and the temperature not showing; this may be because of the thermometer being nearer to the eggs than the capsule, which is affected by the coolness of the eggs to a greater degree. The regulation should not be interfered with, as when the eggs are thoroughly warmed, if adjustments have been made carefully in the first instance, the damper will only lift in the event of excessive heat. Once having adjusted the mechanical regulation, any further regulation should be made by the flame, as regulators have their limits and it is unwise to place undue strain upon them.

Thermometers.

All thermometers should be tested before the commencement of every hatch, and again at any time the action of the regulation system with the temperatures cannot be reconciled. This can be done by placing a clinical and incubator thermometer in a basin of water and gradually increasing the temperature until the clinical thermometer reaches a temperature of 102 deg., and then observe the temperature indicated by the incubator thermometer. If there is any difference, the necessary allowance can be made. If it is expected that there is any serious fault in the incubator thermometer, and no clinical thermometer is available for testing purposes, the bulb can be placed under the tongue. It should read then 98 deg. This method is not so accurate but it will indicate serious trouble.

Temperature.

Temperatures at which incubators are to be operated vary with the position in which the thermometer is situated in the machine and the type of machine. The heat of table-top incubators comes from the top of the machine—consequently, the higher in the machine the bulb of the thermometer the greater the temperature shown. The correct temperature when the middle of the bulb of the thermometer is on a level with the top of the eggs is 102 deg. A thermometer hung with the bulb free of the eggs should read about 103 deg. With cabinet machines, the temperature ranges from 99 to 100 deg.

The heat within the machine is controllable by capsules or thermostat. Occasionally these get out of order by the former leaking, or by the latter becoming bent. Very little can be done for a bent thermostat, but capsules may be repaired. The capsule system of regulation is that most commonly used. This capsule expands with heat bringing into play the regulating device, allowing surplus heat to escape from the egg chamber or preventing the intake of heated air. If the capsule is thought to be faulty and difficulty is encountered in regulating the machine, it may be tested by placing it into warm water for a few seconds. If expansion occurs it will prove that the capsule retains some of the liquid, and if no escape of gas can be detected by smell it is reasonable to assume that it is in good order.

Turning.

Turning the eggs should begin at or about 48 hours after setting and continued twice daily until the 19th day. Occasionally, if the temperature has been a little too high, the eggs will pip on the 18th day. When this happens, turning should cease as the chicken has put itself in a position to release itself from the shell.

When the eggs are placed on the egg tray they should be set at an angle of about 45 deg. with the large end up. To turn these, it is necessary to handle each individual egg unless patent turning devices are used. This may be done by simply pulling the egg over on its small end to the other side. After testing, turning may be done by gently moving the eggs over with the palm of the hand. Complete turning is not essential. All that is necessary is a movement sufficient to make the embryo seek another position in order to prevent sticking to the shell lining.

Cooling.

Cooling is a method of giving the eggs a complete airing with the consequent strengthening of the embryo. The necessity of airing varies with the make of machine because of the variation in the supply of fresh air and operating temperature. It is, however, important to remember that for the first seven days very little airing is required and that the young embryo is very subject to chill. The time it takes to turn the eggs is sufficient. After the first week the eggs may be kept out of the machine until they have lost that burning heat. The period necessary will vary with the stage of development and the outside temperature. A good plan is not to cool the eggs to that degree that the correct temperature in the machine cannot be regained within an hour. In airing, place the eggs upon a table.

Testing.

Testing should be done on the seventh day. It may be done earlier, but the time necessary to do so may result in chilling; furthermore, the germ at an earlier age is not pronounced, and in brown-shelled eggs it is almost an impossibility to discern it unless a powerful light is available. All infertile eggs and eggs in which the germ has died should be removed. This practice gives more room in the tray, facilitates turning, and avoids live eggs being affected with the colder infertile egg. To test, a piece of cardboard having a hole in it similar in shape to that of an egg but slightly smaller, and a lamp are necessary. The cardboard is held up to the light and the egg placed against the hole in it. An infertile egg will be perfectly clear, a fertile egg will have a dark movable spot, about the size of the head of a match, with numerous blood vessels radiating from it, while a dead germ will show as a blood ring or streak, and generally stationary.

Ventilation and Moisture.

Both ventilation and moisture are interlocked. If a machine has a rapid circulation of air through it, it will require more moisture than a machine in which the circulation of air is slow. The reason why moisture is supplied is to prevent a too-rapid evaporation of the moisture content of the egg. Undue evaporation of the egg content is detrimental to good hatches and to the correct development of the embryo. Enlargement of the air cell naturally occurs because of the evaporation of the moisture content and the escape of carbon dioxide through the shell. This enlargement may easily be judged when testing, and, if too great, the

air circulation should be restricted or the moisture content of the air passing through the machine increased. This procedure should be reversed if the enlargement of the air cell is insufficient. Many machines are supplied with moisture trays. These should be filled at the commencement of the hatch and kept filled throughout. When moisture trays are not supplied, the air which passes through the machine carries sufficient moisture. If it is necessary to increase the moisture content of the air taken in by the machine, the floor of the incubator-room may be moistened; in some climates, this may have to be done daily.

Good ventilation is equally essential for the growth of the chicken within the egg as it is for the development of the chick when hatched. Without oxygen the changing of the egg content into a lusty chicken is impossible. It will be understood that the more advanced the embryo is the greater is the need for oxygen, and greater will be the amount of carbon dioxide given off; therefore, what may be the correct ventilation for the first few days will not suffice when the eggs are in the third week of development. The increasing of the ventilation at this period will also assist in the regulation of the temperature of the incubator.

THE SWORD BEAN (*Canavalia gladiata*).

In the *Queensland Agricultural Journal* for July, 1943, an illustrated article appeared on the Sword Bean and the Jack Bean. Dealing with the former, it was stated that it was not thought that the seeds of this variety were edible, and that they had been reported as poisonous in Java. Further, that it would be unwise to take a risk with them.

Since then I have had reports from different people to the effect that they have eaten the seeds and found them quite satisfactory. However, Mr. J. D. Ferguson, of Jimbour, writes:—

“I am forwarding per same mail, under separate cover, three red beans. These I grew from seed sent from North Queensland by a friend who recommended them. Last year I cooked many and had no ill-effects. These were taken from drying pods and cooked white inside. This year the pods were perfectly dry when I used the red beans a week ago. When cooked (soaked overnight and cooked about three hours, same as last year) the insides were much darker. Pods are large, about 1 foot long. Some hours after eating, all members of the family who ate beans were suffering from stomach pains and vomiting, also twitching of leg and arm muscles and coldness. The sickness lasted from four to twelve hours and we felt weak for a day afterwards.”

The seeds forwarded were those of the Sword Bean, and the letter bears out our original advice. The young pods, before the seeds start to form, make an excellent vegetable used in the same way as ordinary French Beans, and for the first time in this State, so far as I know, they have been on sale in Brisbane fruit and vegetable shops.

—C. T. WHITE.

ANIMAL HEALTH

Risks in Trucking Cattle after Dipping.

MARSHALL R. IRVING.

RECENTLY a number of deaths occurred in a mob of fifty bulls trucked by rail immediately following dipping. The bulls ranged from eighteen months to four years of age and were in fair condition. They had been driven 14 miles to the railway siding on a very hot day, watered, and yarded at the dip over night.

Next morning they were dipped in a freshly charged, standard strength arsenical dip mixture at about 6 a.m. As the bulls had never been through a dip before they gave much trouble in the process and were well "worked-up" before the dipping was completed. The animals were trucked almost immediately afterwards, being on rail by 9 a.m. They were trucked in two K and one IC wagons, taking twenty-one head to each K wagon. The journey of 140 miles took about 12 hours through the heat of the day. It was a bad day for trucking cattle, as the meteorological data from two centres en route show that it was raining most of the day, one centre recording 137 points for the 24 hours. Humidity was 73 per cent, wind negligible, and the temperature reached a maximum of 91 degrees F. along the route.

On arrival at their destination the bulls were untrucked in the late evening and remained in the trucking yards over night. Next morning they were driven 6 miles out to a property, and the drover reported no abnormality.

For ten days they remained undisturbed in a paddock of good feed with plenty of shade and were again mustered for the next stage of their journey. They were somewhat stiff when mustered, but were put on the road on a very hot day. After travelling 9 miles they were paddocked in a bad condition of stiffness and overheating. The following morning two bulls died and about half the remainder were very sick.

On inspection, the bulls were found to be very distressed and badly scalded, particularly along the sides. Large patches of skin were stripping off the shoulders and ribs, leaving raw surfaces. Very little scald was showing on the cod or crutch. Nearly all the bulls were scouring badly and the faeces were very black, indicating the presence of much blood.

It was then too late, and individual treatment was impracticable, so they were put into a shady paddock with free access to water. No more deaths occurred, and in three days they were able to return 9 miles to their temporary paddock.

From the foregoing history, it is apparent that the scalding and poisoning were due to a combination of circumstances. The dipping in a standard strength fluid would not in itself cause the deaths. The fact

that they were trucked so soon after dipping, while still wet, and were kept wet by rain throughout the day, together with the very hot humid conditions prevailing were the chief contributing causes of the mortality. This is borne out by the fact that nearly all the scald was on the sides (shoulders and ribs) where the bulls had been rubbing together.

The scald resulting from this combination of circumstances led to the absorption of arsenic through the abraded skin into the blood stream. This arsenic was excreted through the kidneys and bowels, giving rise to the blood-stained scours from which nearly all the cattle were suffering, even twelve days after the dipping.

This mortality demonstrates how necessary it is to avoid excessive handling of recently dipped cattle, particularly when weather conditions are severe. It is always risky to truck cattle within twelve hours after dipping; but they should never be trucked soon after dipping and while still wet. It is better to dip the evening before and allow the animals to dry and recover from the dipping ordeal, and truck them in the cool early morning.

Supplementary Feeding of Dairy Cattle.

C. R. TUMMON, Dairy Inspector.

EVERY year in Queensland dairying districts there is usually a period during which the body of grass available to cattle is very limited, and in order to get maximum production from milking herds, consideration should be given to the feeding of supplementary rations. For every farmer who does feed his cattle during the dry time of the year, there are usually several who do not, and arguments are frequently advanced against the value of feeding. It is desired, therefore, to discuss the advantages and disadvantages of feeding in order to find which is the more economically sound.

When to Feed.

As a general rule in Queensland, hand-feeding of stock is only necessary for about four months when the pastures have reached maturity, are dry and fibrous, and deficient in protein. It is important to commence hand-feeding before the milk yield has declined markedly and before the cows lose their condition. In most districts, the period referred to commences in autumn (April) and extends through the remainder of the lactation period. In the far North, the period of deficient pasture occurs later, and supplementary feeding is advisable, particularly in the normally dry August-November months. If early spring rains do not fall in the Southern dairying districts, supplementary feeding may also have to be resorted to at this time in order to ensure that stock which, in the main, come into profit in the spring commence their lactation under favourable conditions.

Amount to Feed.

The amount of supplementary feed given to each animal will obviously depend on the type of natural feed still available and the type and cost of supplementary foods to be grown or purchased. Supposing, for instance, there is a certain amount of dry grass available which will supply the necessary roughage, it may be more economical to merely supply the necessary concentrates, such as maize meal, meat meal, &c., rather than to feed ensilage as well. Using maize meal and meat meal as

supplementary ration, it will be found that about 2 lb. maizemeal and 4 oz. meatmeal twice a day will be enough to maintain condition and give increased production. Any of the cereal grains may be substituted for maizemeal according to their availability and relative price in any particular district. These grains should be coarsely ground for feeding to dairy cattle.

However, when hand feeding is suggested it does not necessarily mean that food has to be bought. It is possible for farmers to grow their own crops, and feed them off to the dairy herd by direct grazing, or as chaff or ensilage. Of course, by good management of a dairy farm, the amount of supplementary food to be supplied during the dry period of the year may be considerably reduced. By this is meant to get the absolute maximum out of the natural pastures by the avoidance of overstocking, the renovation of pastures by harrowing, fertilizing, or otherwise, by dividing the property into numerous small paddocks and applying rotational grazing, and the sowing of grasses which give the best results in that particular district.

Disadvantages of Feeding.

1. Extra work involved: Naturally there is extra work necessary both in providing foods in the form of crops, &c., and also in the daily feeding of same to stock.
2. More time is required: At present, owing to wartime difficulties, this is an important factor on dairy farms.
3. Cost: As the cost of stock foods is rather high at present, many farmers are not prepared to spend the money, as the immediate return does not seem to warrant such expense.

Advantages of Feeding.

1. Increased production: Increased production is immediately brought about, and this in itself is very important, particularly now when maximum production of dairy produce is demanded. This increase in production usually more than pays for the cost of the feed, so this factor may be discarded from the list of disadvantages.
2. Cattle kept in good condition: This is also important because when rain does fall the animal in good condition will respond immediately with her production, whereas the poor cow has to divide her feed between milk production and flesh forming. In addition, a cow in good condition which is carrying a calf may properly nourish the calf, which in turn will result in a better cow for the future herd. Also, cattle maintained in good condition have a greater resistance to disease than those which are under-nourished.
3. Benefit derived after feeding is stopped: Non-fed cattle may be so spent in their lactation when rain comes that they may take weeks to come back to anything like good production, and may possibly get back only to about half the quantity that the well-fed cow would be giving. It may be seen, therefore, that the benefit of feeding is often felt for months after the feeding stops.

It is very obvious that the advantages of feeding far outweigh the disadvantages, and every farmer should therefore be determined to make provision for feed to carry his stock over the dry part of the year, without any loss in production, but with considerable increase to his profits.

FARM ECONOMICS

A Note on Co-operation.

C. H. DEFRIES, Instructor in Agriculture.

CO-OPERATION is many-sided, and the word may conjure up thoughts of anything from the gigantic organisations found in Great Britain or pre-war Europe to the activities of two men who combine together for a common purpose. This latter end of the scale does not make the headlines, but it is nonetheless of importance, and it is with this aspect of co-operative effort that we are concerned at present. It is deserving of some attention by farmers because, notwithstanding the fact that many are taking advantage of the opportunity for co-operating with their neighbours to an extent much greater than previously, there still remains a tremendous field of neglected endeavour in this direction.

Every day one can see instances in farming districts where the pooling of labour or machinery on two or more farms would enable a job to be done more quickly, more cheaply, and with much less exasperation than if the individual carried on on his own. This type of small scale co-operative effort would be important enough even if it were only a minor remedy for some of the shortages that are the result of the war. Its benefits go deeper than that. Any more extensive co-operative effort such as would require an organisation for its success is based primarily on the men and women who make up the membership of the co-operative society, and if two can and do co-operate successfully in minor affairs, it is far more likely that two hundred will succeed in the larger effort. Thus, if co-operation is to develop after the war as one of the means by which farmers can protect themselves against the inherent disadvantages of primary industries in an industrialised world, as many think will be the case, then now is the time to lay the foundations and to show that such a development has a reasonable chance of success.

“There is a good deal of human nature in most men.” These words from an address by Alfred Marshall, the famous economist, to the Co-operative Congress in Great Britain fifty-four years ago are a reminder that many all too human traits stand between an obvious need for co-operative effort and its accomplishment. We hear a good deal about the individualism of the Australian farmer, and that it is this factor that precludes him from co-operative effort; but, after all, if individualism means anything it denotes a capacity to rise to the occasion, and if ever there was a time when co-operation is essential it is during a period such as the present. Perhaps it is not only individualism as such that is at the root of the problem. There are all sorts of mental resistances, jealousies, and habits that are equally if not more important. Men get used to running their farm as a single unit without any but occasional help from neighbours, and the mental effort necessary to change this outlook is not always forthcoming; it is not altogether clear

that individuality should be lost by the change. Some measure of adversity, financial or otherwise, might be necessary to overcome such mental sluggishness, and if this is so our present circumstances may produce some tangible benefits of this nature; in fact, they seem to be doing so. Whatever the reason, we should all be fully conscious of the fact that we are only now creating the real traditions of our agriculture, which, after all, does not go so very far back into the past. It is at least one of our duties to ensure that these traditions are formed as a response to something deeper and more substantial than the habits of selfish preoccupation and the jealousies that preclude the actualisation of co-operative effort.

To approach the matter from another angle: if we regard it as purely a problem of farm management, the arguments in favour of co-operation between farmers are just as cogent. Every farmer knows that there are some jobs in the performance of which two men working together can attain a greater output in the same time or the same output in less time than could be accomplished by two men working singly. Fencing is an obvious example. There are many farm operations—planting crops such as potatoes, sugar-cane, some vegetables, &c., harvesting, and so on, where this principle of team work applies, and there is no doubt that on thousands of farms to-day it is being put into operation, and that on as many more it could be. Similarly, in the use of tractor power the opportunities for co-operative effort are very frequent. A farmer might have only one of his tractors in working order, a light cultivation type. On a nearby farm the heavy type used for ploughing, &c., might be the only one available. The advantages of the joint use of the two machines on both farms are obvious, and usually outweigh any disadvantages that might present themselves. The transport of produce to market or railhead is another example of particular significance at the present time. No doubt a certain measure of give and take is required for the successful fruition of co-operative effort of this nature, but experience has shown that this is not beyond the capacity of most farmers.

The object of every farmer at any time and particularly now should be to use his own labour and that employed on the farm together with his machinery and equipment with the object of attaining the greatest possible efficiency. This is merely a small scale replica of the eternal economic problem of the adjustment of limited means to secure maximum results. The farmer's means are his land, his equipment, and his labour, and he does not have to be told how limited they are. The results he seeks are the maximum outputs of vital foodstuffs or raw materials. True economy would so use the means as to secure the maximum returns at minimum cost. If, then, co-operative effort can overcome the disadvantages of the limited means and reduce the cost of their utilisation, the farmer benefits by a greater profit margin and the nation gets more food.

TIMBER MEASUREMENT.

A "superficial foot" of timber is a piece 12 in. long and 12 in. wide and 1 in. thick or any combination of dimensions with the same cubical contents, such as 3 in. by 4 in. by 12 in.; 2 in. by 6 in. by 12 in.; or 6 in. by 1 in. by 24 in. To measure timber in super. feet, multiply breadth, width, and length (in inches) and divide by 144.

Knots to Know

Considering the extent to which ropes are used on the farm, a knowledge of splicing will frequently prove to be a very useful asset. Not only is the splice neater than any knot, it is also more convenient to handle, and if properly made it will still enable a broken rope to be used for pulley work.

Two types of splice are commonly used for joining rope lengths—the short splice and the long splice. The former is quite suitable for all general purposes, but where the rope is intended to pass easily over a pulley the long splice is much to be preferred. For practice work a slightly worn rope is better than a very new or a very old rope. A marlinspike is useful for opening up the rope.

SPLICING ROPES.

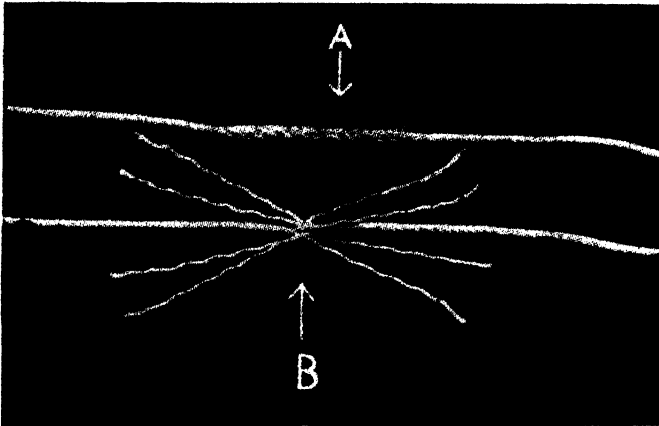


Plate 138.

SPLICING ROPES.—Short splice showing start and finished.



Plate 139.

SPLICING ROPES.—Long splice, showing one pair of strands completely worked in at Fig. A and two pairs cut off ready to be worked into rope at Fig. B and Fig. C.

The Short Splice.

In a short splice the work is commenced by laying the strands back a short distance according to the size of the rope. For ordinary 1½-inch plough line, seven inches on each of the ends to be spliced will be ample. The ropes are now intermeshed, with each strand of No. 1 rope between two strands of No. 2 rope. (See Plate 138 (B.)). One set of ends should now be lashed to the opposite rope to hold them in position while the other set is being spliced.

The strands of rope 1 are now interwoven along the unwound part of rope 2 by crossing each *over* its immediate neighbour and *under* the next. The rope may be twisted so as to open the strands, but it should be turned back again to tighten it as each strand is passed through. As each strand is dealt with, the rope is turned round in position for the next. When one circuit has been completed the strands of No. 2 are woven into No. 1 and this process is repeated, completing alternately a circuit at each end, pulling the strands up tight, and twisting the rope back to its original position to prevent slackness.

Where a tidy splice is desired, the strands may be gradually reduced in thickness, but cutting out one or more yarns at each circuit. The finished splice will then taper gradually from the centre to the ends. When the splice has been completed it should be rolled underfoot on an even floor to lock the fibres. This greatly improves the appearance of the splice, and the loose ends of the strands may then be safely cut off close to the ropes.

The Long Splice.

This is more difficult to make than the short splice, but it is neater and is much to be preferred for pulley work.

Since it is three to four times the length of the short splice, the strands must be laid back a correspondingly greater distance, that for ploughline being about 2 feet. The rope ends are brought together in the same manner as when making the short splice. A strand of rope No. 2 is then laid still further back up the rope, and a corresponding strand of rope No. 1 is worked into place. In the same way a strand of rope No. 2 is worked into the place of a corresponding strand which has been laid back in rope No. 1. As each strand is laid up into position, sufficient length should be left over to work into the main rope for the finish. In a three strand rope each pair of strands should now project from the rope at the same distance from those remaining at the centre.

Plate 139, Fig. A, shows one end of the long splice completed, and the other strands ready for knotting and interweaving. (Note the difference in the lengths of the ends.)

The splice is usually finished by taking about three quarters of each pair of opposing strands and tying these together in the first loop of a reef knot, with the

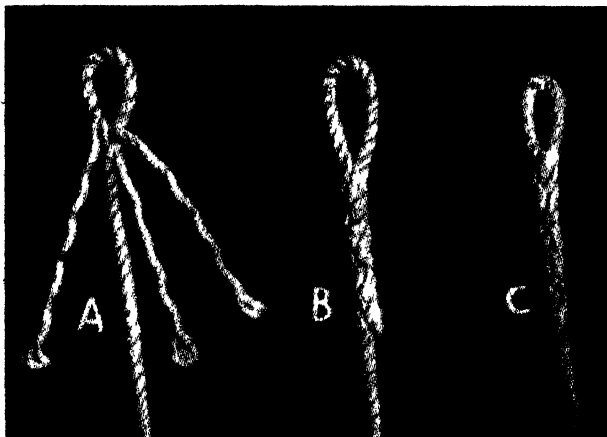


Plate 140.

EYE SPLICE: Fig. A—Start; Fig. B—Completed; Fig. C—Taper finish.

ends still pointing in these original directions. The six ends are then worked into the rope, each being gradually tapered off, the last fraction of each strand remaining being cut off and the end tucked into the rope.

The Eye Splice.

This will be found very useful on leg ropes or for a running noose. It is also frequently worked round a thimble for fixing to the end of a chain or wire, though this operation requires considerable practice.

The strands are laid in the same manner as when commencing the short splice, the rope being doubled back to make the loop (Fig. A).

Holding the loop firmly with the left hand, the strands, commencing with the middle one, are woven into the rope with the right. It should be noted that when the rope has been doubled back the central strand should come over from the top, and the work should be commenced by weaving this strand *across* and *not with* the twist of the rope. Each strand is then taken in turn and worked alternately over and under corresponding strands of the neck of the eye, working always across the direction of twist.

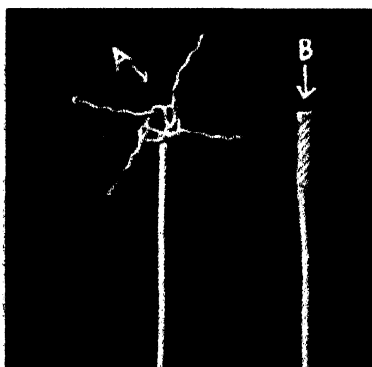


Plate 141.

CROWN KNOT: Fig. A—Start;
Fig. B—Finish.

Crown Knot.

This is performed by crossing the strands above the crown as shown in Fig. A. The ends of the strands are now pulled up tight, when it will be found that they point backwards along the rope, so that they can readily be spliced in as in ordinary short splice. In practice the splicing is desirable, as a crown knot is liable to come undone. This method leaves a large knob on the end of the rope. (Fig. B.)

Spliced Crown.

In practice the best and neatest of all finishes is made by laying back about eight inches (for plough line) and then making a loop of one strand. The strand is then passed right round the rope and through the loop (Fig. A). Each strand in turn is then treated in this way—passing through the original loop and its own loop until the last strand passes through all the loops. The ends are then pulled up tightly, when they may be cut off short with no danger of their becoming undone (Fig. C).

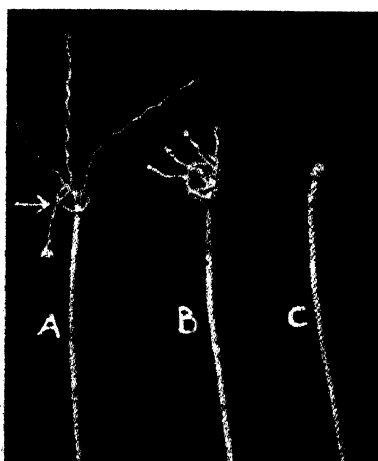


Plate 142.

SPLICED CROWN: Fig. A—Start;
Fig. B—Strands looped; Fig. C—
Strands tightened up and cut off.

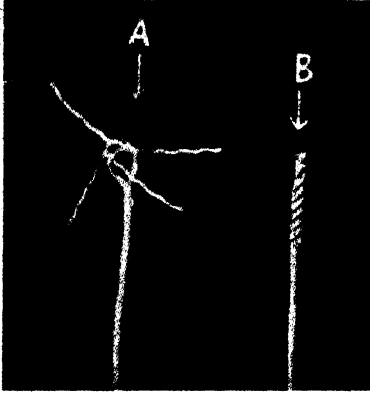


Plate 143.

END SPLICE: Fig. A—Strands looped; Fig. B—Strands pulled up and spliced back.

The End Splice.

Trouble is very frequently experienced with ropes unravelling from the end. While this may be prevented by lashing the ends or by tying a knot, neither of these is quite so satisfactory as simply capping the end.

To obtain an end splice the strands are laid back a few inches, and a turn of each is taken round its neighbour (Fig. A). In a three-strand rope the third strand, after being turned round the second, is passed upwards through the loop formed by the turn of the first strand. The ends are now pulled tight and cut off about half an inch from the knot. They should not be cut too close or the knot will tend to loosen (Fig. B).

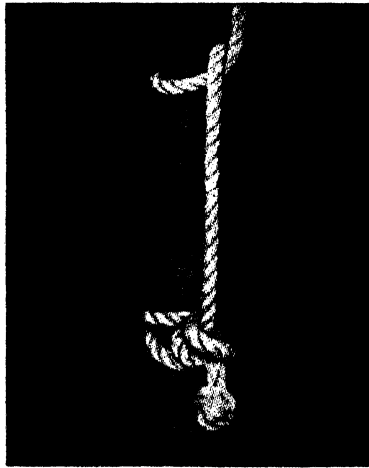


Plate 144.

WELL PIPE HITCH.

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GADGETS AND WRINKLES

WOOD VISE JAWS.

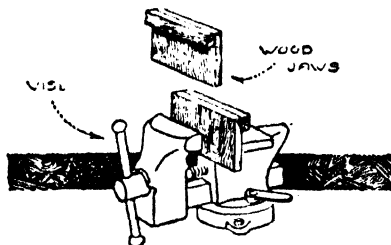


Plate 145.

Most farm shops are equipped with a metal vise, but such a vise is not suited to wood work. The jaws of a metal vise are small and sharp and cut into wood badly. The purpose of the wood jaw pads illustrated here is to enlarge the clamping surface and afford a cushion for the jaws, making the vise suitable for wood as well as for iron work.

These pads are made of hard wood, their size depending upon the size of the vise they are to be used in. The grain should run up and down. A cleat about an inch and a-half wide is fastened along the top of each of the wood

pads. Wood screws are used for this purpose. This cleat keeps the pad from splitting and also holds it in place when the vise is opened up, for it rests along the top of the vise jaw. A metal vise equipped with these pads will hold a board firmly without injury to the surface.

TO MEASURE DISTANCE.

To measure the length of a drain, a paddock, or a fence line, tie a piece of white rag round the rim of a wheel of a vehicle, drill, or spreader, and drive along the proposed line or route, counting the number of the revolutions of the wheel. Then measure the circumference, or the distance covered by one complete turn of the wheel on the ground, and multiply the result by the number of revolutions of the wheel already counted to get the total distance of the proposed line or route.

INTEREST TABLE AND CALCULATION.

2½ per cent. is 6d. in £
 3 per cent. is 7½d. in £
 4 per cent. is 9½d. in £
 5 per cent. is 1s. in £
 6 per cent. is 1s. 2½d. in £
 7½ per cent. is 1s. 6d. in £
 10 per cent. is 2s. in £

12½ per cent. is 2s. 6d. in £
 15 per cent. is 3s. in £
 17½ per cent. is 3s. 6d. in £
 20 per cent. is 4s. in £
 22½ per cent. is 4s. 6d. in £
 25 per cent. is 5s. in £

At 5 per cent. per annum, the amount of interest on £1 for every month is 1d.; having ascertained what this amounts to, other rates may be reckoned by adding to or dividing it.

2½ per cent. is one-half.
 3 per cent. is six-tenths.
 3½ per cent. is seven-tenths.
 4 per cent. is four-fifths.

Thus 5 per cent. on £60 for ten months would be £2 10s., because sixty pennies equal five shillings, multiplied by ten give fifty shillings.

£60 at 2½ per cent. is £1 5s. for ten months.

£60 at 3 per cent. is £1 10s. for ten months.

£60 at 3½ per cent. is £1 15s. for ten months.

£60 at 4 per cent. is £2 for ten months.

If the rate of interest be more than 5 per cent., the fraction must be added.

Thus, to reckon 6½ per cent. add ½; 7½ per cent., ¾.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BABY'S MILESTONES.

Learning to Walk.

MOST of us have watched at some time or another the first staggering steps of a one year old—and no doubt appreciated the charm of his pride in the new achievement, as we waited for the inevitable bump at the end of the performance. But how many of us realise what a complicated mechanism walking is and that its success depends on a whole series of activities which have preceded it as well as on the strength of baby's structure of bone and muscle?

A baby should not walk unless he has previously learnt to hold on and pull himself up, and also to crawl—as crawling is very useful for all round development and should be encouraged. He must have co ordination of his eye muscles so that he can direct his steps as well as a sense of balance and firm, elastic leg muscles.

The average baby develops his own mechanisms with very little help and the mother should assist—not by sitting or standing baby up or trying to make him walk before he is ready, but by providing the necessary incentive to development, as well as, very importantly, the right foods.

Do not hamper a baby with too many clothes or too tight napkins or panties. Buy or make a play-pen for him, in which he will first exercise his muscles by vigorous kicking and rolling about and stretching out for his playthings. The sides of the play pen are excellent for a baby to learn to pull himself up and, if brightly coloured toys (strings of painted cotton reels do quite well) are hung on the sides he is encouraged to move around and examine them one by one. Later, he will learn to sidle along from rail to rail, and so very gradually the whole mechanism is built up and baby takes his first steps by himself!

Now is the time when the mother should be patient. Remember, it is the baby who is learning, and so let him shoulder his own responsibilities and face up to his own mistakes.

Do not be sentimental over his tumbles—they have to come. A baby has to learn not only to get his balance on the straight but to negotiate corners, climb elevations, and so on; he even has to allow for the unexpected presence of a slippery patch, a moving rug, or a strolling cat. We all learn by doing the wrong thing and finding the result a little painful—a baby will develop much more normally if he is allowed to learn that way, too. So, while taking reasonable precautions, do not overprotect him but rather encourage him. He will not be afraid if he is allowed to realise that it is his own lack of practice which is at fault and that he really is improving. One cannot but be impressed by the perseverance of a child in spite of his falls and setbacks. He may well prove an example to many who are older.

Questions on this or any other matter concerning Maternal and Child Welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters: "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

In present circumstances, recommendations are subject, of course, to the availability of the ingredients mentioned or of suitable substitutes.

Haricot Bean Soup.

Soak 4 oz. haricot beans overnight, then place them in a casserole dish with enough stock or water to cover. Cover with a tight-fitting lid and cook until tender. Turn into a saucepan with 1 lb. sliced tomatoes, 2 minced onions, 3 or 4 stalks of chopped celery. Add more stock to more than cover vegetables and simmer until vegetables are tender. Rub through a sieve and keep hot. Melt 1 dessertspoon butter in a saucepan, add 1 dessertspoon flour; cook a little, add puree, and stir until it thickens, then add hot milk to the required thickness. Season with pepper, salt, and a little grated nutmeg.

Cream of Spinach.

Cook 1 bunch spinach in the usual way and rub through a fine sieve. Melt 2 level tablespoons butter in a saucepan, add 2 level tablespoons plain flour and cook a little, add 2 cups stock and bring to boil and then simmer for 5 minutes. Now add 2 cups hot milk and spinach, salt and pepper, and if liked a little grated nutmeg. A little cream may be added just before serving.

Stuffed Tomatoes.

All sorts of tasty little odds and ends may be used for stuffing tomatoes. Use firm tomatoes, cut a slice from the top, and scoop out some of the pulp. Mix with the pulp some grated cheese and breadcrumbs, minced meat, chicken, or ham, smoked or free cooked fish, mushrooms, or celery. Flavour with pepper and salt, refill the tomatoes, sprinkle with fine breadcrumbs, and place on the top of each a small piece of butter. Bake in a moderate oven for twenty minutes.

Tomato Toast.

Take 1 ripe tomato, 1 egg, 1 oz. cooked ham, $\frac{1}{2}$ oz. butter, a flavouring of onion, salt, and pepper. Peel the tomato, cut up, and mince the ham and onion. Melt the butter, add the tomato, and cook for a few minutes, stirring all the time. Take from the fire to cool slightly, add the beaten egg, stir over the fire till it thickens, and serve on hot buttered toast.

Tomatoes with Cheese Cream.

Take 3 or 4 tomatoes, 1 gill cream, $1\frac{1}{2}$ oz. grated parmesan cheese, 2 table-spoonsful aspic jelly, salt, and pepper. Cut the tomatoes in half, remove some of the pulp, and drain them. Whip the cream stiffly, season with salt and pepper, whisk in the aspic jelly, which should be liquid, but cold. Add the grated cheese, fill the tomato shells, and pipe a pretty border with a rose pipe. Garnish with cress and serve very cold.

Eggs and Tomatoes.

Take the required number of fresh eggs, firm tomatoes, slices of fried bread, salt and pepper, salad.

Cut a slice off the end of each tomato, scoop out some of the pulp, and season the inside of the tomatoes with salt and pepper. Into each one carefully break an egg, put on the lids, and bake in a moderately hot oven until the eggs are set. When cold, serve garnished with salad.

Pork Pie.

Take 1 lb. minced pork, 1 pig's foot (for jelly), and prepare as follows:—Take 1 lb. self-raising flour, melt $\frac{1}{2}$ -lb. lard, pour over flour and work into a dough. Line a cake tin, fill with minced pork, and cover with remaining dough. Bake in moderate oven for one hour. Cover pig's foot with water, bring to boil, and allow to simmer for one and a-half hours. Strain and season to taste. Allow stock and pie to cool a little then pour pig's foot stock into the pie and allow to cool and set.

This is a very nice dish and is readily prepared. If available, two pig's feet may be used instead of one to provide for a richer stock and jelly.

Baked Cabbage.

Shred a fairly large cabbage finely and soak in cold salted water until crisp. Drain well and put in a large saucepan with a tablespoon butter, pepper, and salt to taste. Cover well with a tight-fitting lid and cook until tender. Stir now and again during the cooking to prevent burning. Allow to cool then add 2 well-beaten eggs, 1 tablespoon shredded and fried bacon, a little grated nutmeg. Well grease an ovenproof dish or basin and sprinkle thickly with brown breadcrumbs. Fill centre with the cabbage and cover with more breadcrumbs. Bake in a hot oven for half an hour, turn out and serve with brown sauce or as a vegetable to serve with roast meat.

Baked Rhubarb Pudding.

Stew 1 bunch rhubarb in the usual way, using as little water as possible. Remove the crust from stale white bread and weigh 1 lb. Cover this with just enough milk and when quite soft squeeze out until almost dry. Mix this with 2 oz. of finely grated suet, 2 oz. sugar, and 1 beaten egg. Line a well-greased round cake tin with this mixture, reserving enough for top. Fill with rhubarb, then cover with the remaining bread mixture. Bake in a moderate oven for 1½ hours. Turn out carefully and serve hot.

Steamed Wholemeal and Honey Pudding.

Pour 1 cup hot water over 2 cups fine white breadcrumbs (or wholemeal). Allow to soak for a few minutes, then add ½ cup finely chopped suet, 1 cup sultanas, 1 cup wholemeal flour, ½-cup honey, 1 well beaten egg, a little grated nutmeg, ground cinnamon, and a little mixed spice if liked. Dissolve ½-teaspoon bicarbonate of soda in 1 tablespoon hot water and add to mixture. Beat well together and steam in a well-greased mould for 3 hours. A little sugar may be added if needed a little sweeter. Before serving, stud with blanched whole almonds.



Plate 146.

BACKYARD FOOD PRODUCTION.—A Brisbane housewife anticipates a vegetable shortage and prepares for it. Every plot has a "signboard" with all relevant data duly set out on it.

QUEENSLAND AGRICULTURAL JOURNAL

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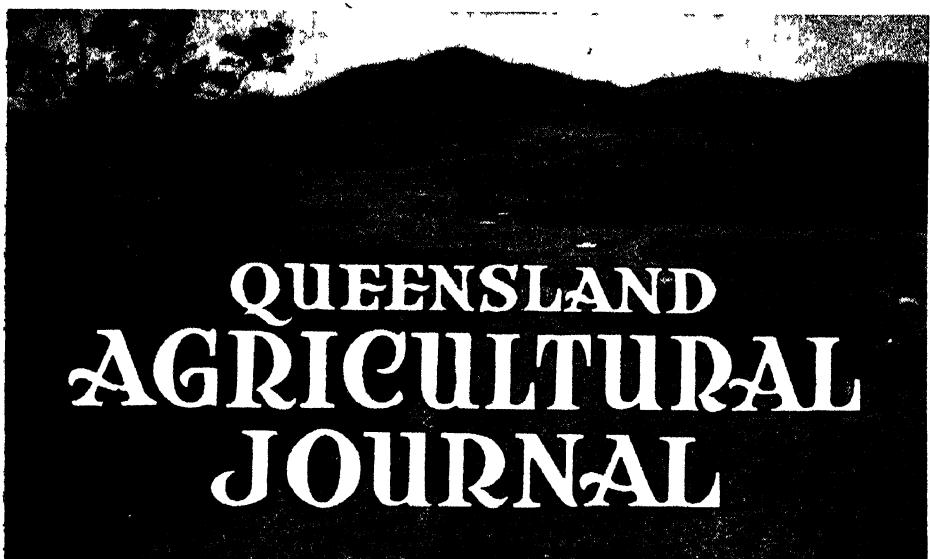
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Event and Comment.

Rural Rubber Requirements—the Supply Position.

TO satisfy the needs of primary producers particularly, special efforts are being made to ease the position arising from the shortage of rubber tyres and tubes, according to advices received from the Ministry of Supply and Shipping. Because of war conditions, the crude rubber shortage is general, and what is available is obviously reserved for the priority needs of the Allied Forces. Although synthetic rubber production in the United States is proceeding steadily, American manufacturers have not reached the stage at which all types of tyres can be made predominantly of synthetic materials. It is still necessary to use a proportion of crude plantation rubber in most of the larger tyre sizes, which make up the bulk of present-day production, consequently stocks must continue to be drawn on until such time as the production of tyres solely from synthetic rubber becomes practicable on an appreciable scale. The following statement was recently issued in London by the Combined Raw Materials Board and published in the *Financial Times* :—

“The considerable progress achieved in America’s synthetic rubber programme has led to a certain lack of appreciation concerning the United Nations’ need for natural rubber. Since this misunderstanding threatens to hamper the United Nations in securing the largest possible amount of natural rubber from the few producing areas still under our control, the Board wishes to emphasise in the strongest possible terms our urgent need for crude rubber.

"Very careful estimates have been made of the quantities and types of tyres and rubber products required to be produced for military and essential civilian use during the coming year. Authorities both in the U.K. and U.S. are reducing to a minimum the amounts of natural rubber which manufacturers will be permitted to use in meeting this programme.

"None the less, the amount of rubber which must be released if essential needs are to be met will dangerously deplete natural rubber reserves and leave the stock position of the United Nations at the end of the year at below the minimum hitherto regarded as necessary. The situation in 1945 will be further aggravated unless more natural rubber than is now in sight is forthcoming."

The foregoing demonstrates the necessity of the present rigid control of distribution of the limited quantities of tyres which can be made available for essential civilian purposes. All applications for tyres are closely examined, but despite this and the close examination of the whole problem of making sufficient tyres available for the maintenance of civilian transport, it is clear that it is impossible at the present time to re-equip a large number of motor vehicles. For this reason, the Commonwealth Department of Transport, through the State Directorates of Emergency Road Transport, which operate in the closest collaboration with the rubber control sections of the Ministry of Supply and Shipping in the several States, has had to progressively apply a policy of transport rationalisation.

The Ministry of Supply and Shipping is fully impressed with the fact that the maintenance in full production of foodstuffs projects is of the highest importance. The supply position of tyres for primary producers is under constant review, and every effort is being made to find ways and means of allocating a greater quantity to meet their essential needs. Where efforts have succeeded no time has been lost in easing the situation to the greatest possible extent.

The tyre position in Queensland has received particular attention for several months past. Since last December, the basic quota for motor and utility car tyres for this State, which was determined on a strictly equitable basis in relation to the quotas for other States, has been progressively increased by special allocation to the extent of 127 per cent. for the four-month period ended 30th April last. In the main, these special allocations have been distributed to primary producers. Because of war conditions, tyre manufacture is restricted to a limited range of standard sizes; tyres not included in this range are extremely difficult to replace.

It will be appreciated generally that, in existing circumstances, difficulties in meeting all deserving claims will continue. Primary producers are among the largest and most important sections of essential users, and their co-operation in the wide adoption of community carting is necessary if delays in transportation are to be avoided. Preference in tyre supply is given to isolated farms where co-operative carting is not practicable. There are, of course, many degrees of essentiality, but very close watch is being kept on the whole position, and every effort is being made to maintain the transport systems of the farming and grazing industries and extend to them as much relief as can possibly be afforded. Moreover, facilities of repairing and re-treading plants are being increased, as far as practicable, throughout the Commonwealth.

Field Crops

Potato Production in North Queensland.

T. G. GRAHAM, Instructor in Agriculture.

POTATO growing in North Queensland on an appreciable scale dates back about thirty years. Expansion proceeded slowly until two years ago when the increase in production became rapid, as a result chiefly of improved cultural methods and a more extensive use of fertilizer.

In the early days of potato development in the North, low yields and the incidence of potato tuber moth were retarding factors. The northern crop is grown almost entirely under irrigation, and matures during winter. Spring crops may be grown on the Atherton Tableland under natural rainfall conditions, but yields are not very reliable, and little expansion has taken place there. Most of the northern potato crop therefore is grown between Mackay and Ingham, with by far the greatest production in the Burdekin Delta.

Soil Requirements.

For the potato the range of soil requirements is wide, but friable, well-drained, fertile loams give best results. Growers are referred to the *Queensland Agricultural Journal*, Volume 57, Part 1, July, 1943, and to the *Queensland Agricultural and Pastoral Handbook* (Volume 1), in which many aspects of potato production are dealt with fully. This article deals more specifically with the irrigation aspect, particularly in respect of North Queensland conditions.

Preparation of Soil.

The primary objects in preparing a seed bed for potatoes are:—

- (1) To kill weeds.
- (2) To pulverize the soil to form a mellow seed bed.

It is impossible to produce maximum yields from badly prepared land. The object, therefore, is to plough in a green manure crop at a depth of from 10 to 12 inches if practicable, in late February or early March to enable the legume to rot away, and the soil to mellow down during the rainy period of March. Attention should be given to the time of ploughing, and care should be taken as far as practicable to ensure that the optimum period of soil moisture is reached before ploughing commences. Soils ploughed when too wet or too dry lose their physical condition, and the valuable crumb-like structure is destroyed. A second ploughing about six inches deep should be given

just sufficiently in advance of seeding to kill any weed growth, and to aerate the soil. A cultivation is desirable to check any weeds immediately preceding planting, especially if rain has fallen since ploughing, but in any case to even off the field.

Seed.

Growers in North Queensland are at a disadvantage since they are unable to save their own seed. They are dependent entirely on the quality of the seed material sent from southern States. Cutting the sets is not practised as a general rule, since the risk involved is considered to be too great. Because of this, it is most desirable that the seed for the northern crop be specially selected as to size, in order that the planting rate may be kept at a minimum. None other than treated, certified seed should be used.

Many farmers take too little care with their seed. All potatoes should be well forward before planting. Uniformity of the crop cannot be obtained otherwise; but generally, consignments of seed have commenced to move at the time of taking delivery. When potatoes commence to shoot, they should be removed from the bags, all damaged and diseased tubers rejected, and the sound potatoes spread out to a depth not exceeding three inches, in a cool, dry, shady place. Crates are by far the best storage containers, but as yet are not used in the North. This process is called "greening," and its object is to form strong green shoots with many nodes. Seed shot in bags will quickly develop long slender white shoots with a few nodes. These shoots, moreover, are easily damaged, and a large proportion are rubbed off in handling. The importance of greening, apart from aspects already pointed out, will readily be apparent when it is remembered that stolons form from the nodes of the underground stem. The more nodes therefore in a unit length of stem, the greater the potential yield of tubers. Compare, for example, the short green shoot of a greened potato with that of a long white spindly shoot from a tuber which has been allowed to remain in a dark, badly ventilated place too long. Seed potatoes stored in crates require far less handling than those stored in a loose heap, as they may be planted out directly from the crates.

Varieties.

Two main varieties are grown in North Queensland, namely, Brownell and Bismarck. These varieties are well suited to the conditions, they comprise the main source of available seed at the appropriate time of the year, and they have shown a marked resistance to disease. Many other varieties have been tried from time to time, but until recently no detailed experiments have been carried out. Katahdin, a late maturing variety resistant to mosaic, has given good results in the southern States and is showing great promise in the North. Growers should refrain from planting new varieties in any quantity until careful observations have been made, and their value clearly demonstrated.

Fertilizer.

Fertilizer trials have been conducted by the Department of Agriculture and Stock over a period of years, and the results indicate an improvement in grade and yield. The best results to date have been obtained by the application of a mixture of sulphate of ammonia and superphosphate in equal proportions, at the rate of from 4 cwt. to 7 cwt. per acre. Applications of heavier than $3\frac{1}{2}$ cwt. of sulphate of

ammonia in a fertilizer mixture had a detrimental effect on germination. This has been due to tubers coming in direct contact with the fertilizer, since in all the trials the fertilizer was spread along the bottom of the drill just before planting. Larger quantities could, no doubt, be applied with advantage if the fertilizer were kept from direct contact with the sets. According to American opinion, the placement of the fertilizer has an important bearing on early growth and ultimate yield. Best results have been obtained where fertilizer has been placed on either side of the drill about two inches from and slightly below the level of the seed. Observations in the Burdekin Delta tend to confirm this. This method also ensures a loose layer of soil below the seed. Fertilizer machines which traverse the row are available in the canegrowing areas, and if they do not place the fertilizer in bands, they may be easily altered to do so. Potato-planting machines have the necessary fertilizer distributing attachments.

Sulphate of ammonia is necessary to promote growth, while superphosphate tends to even up the crop and induce early maturity. Dried blood, at the rate of 5 cwt. to the acre, has given good results on some soils, but the resultant crop has a tendency to be more uneven.

For best results fertilizer should be applied at the time of planting

Planting.

The best method of planting potatoes is to open up furrows by means of a drill plough, the required distance apart, place the tubers by hand, and cover by splitting the interspace between the drills. This leaves the potatoes in ridges, with ample drainage assured should heavy rain fall. Mechanical planters do an excellent job, but a more even stand is obtained by hand planting. Ploughing-in is sometimes adopted, but the method is rarely used in the North. Planting should follow soon after the application of fertilizer. It is advisable not to open up too many furrows in advance, and to close them again as soon as possible after seeding. The aim should be to avoid loss of soil moisture in the process.

The chief consideration determining the distance between rows, and the distance apart of sets, is the fertility of the soil, and the amount of available soil moisture. In dry land potato production, the spacings are wider, and the amount of seed planted is much less than with irrigated crops. Under irrigation, row spacing varies somewhat, but usually, as a matter of convenience in cultivating, ditching, irrigating, and digging, the rows are spaced from 39 to 42 inches, and the seed pieces are planted from 10 to 15 inches apart, depending on variety, and fertility of the soil. Wide ridges are important in irrigated districts, as they give ample room for tuber development and provide sufficient soil for hilling against tuber moth infestation. Under irrigation close spacing within the rows has been found necessary with some varieties to reduce the size, to minimise growth cracks and hollow heart, and to secure maximum yields. The tendency to produce "bolters" is far less when close spacing has been practised, and the experience in experimental trials, is that a uniform crop is produced when the spacing is 12 inches. With this spacing and the fertilizer application as recommended, very few unsaleable potatoes have been observed.

Cultivation.

Harrowing as a practice before the plants emerge from the soil, is growing in favour. It has the advantage of killing early weeds, breaking any crust that may form, and smoothing out the ridges left by the drill plough. Should weeds become troublesome, with the customary methods of planting, the rows can be followed before the plants are up. To cultivate rather deeply after planting is a good practice. A week later, it is advisable to go over the field lengthwise with a set of harrows, to level the ridges and check weed growth. If necessary, this harrowing should be followed again by a lighter harrowing in the same direction. Thoroughness in this operation will save much time and labour later on, for weeds are killed much more easily in the seedling stage than after having become firmly established. About the fifth week from planting, the time for the first watering should be drawing near. In preparation for this, the best practice is to run the scuffler down between the rows, with the object of killing weeds, and loosening the soil. This should then be followed by the drill plough, or butterfly, or tractor hilling attachments, throwing the earth up lightly towards the plants, forming a water furrow.

The number of cultivations vary with conditions; the purpose is to kill weeds, to aid surface absorption of water by keeping the surface friable, and to provide a hill which prevents moth attack. Since weeds remove plant food and moisture, they must be thoroughly controlled. If weeds get a good start early in the season, the job of keeping them in check becomes well nigh impossible. As soon as practicable after the first watering, cultivate as deeply as possible, setting the outside shovels slightly shallower to throw a little soil into the rows. See that this cultivation loosens up the soil thoroughly. Potato roots grow near the surface, so late cultivations should be more and more near the surface to avoid root pruning. When the plants cover half the row, set the cultivators narrower, and do not run them deeper than 2 or 3 inches. Drilling should immediately follow cultivation in order to throw a loose layer of crumbly moist soil up to the plants; the land is thus ready for watering as soon as it is deemed necessary to irrigate again. As a general rule, hilling should follow each watering. Where irrigation is practised, the ill effects of hilling by loss of moisture, are counter-balanced, and the grower is thus able to direct his energies along the lines of hilling to prevent tuber moth attack.

As soon as practicable after the last watering is given, approximately two weeks from harvesting, a final complete hilling should be given. This may be done with two 20-inch discs attached to a specially constructed frame of simple design, which throw up furrow slices which meet over the tops of the haulms, and fall as a curtain over the stems, thus affording protection against an attack of tuber moth. The danger of tuber moth attack increases as the season advances, but the risk increases enormously during the last three weeks of the life of the crop. It is during this period that the grower has to exercise the greatest care.

The type of hill is important. The object should be to make the earth on each side of the plants meet in the centre, thus forming a peak, and not have a space along the row of plants where the soil has not met. Many farmers imagine they have done an effective hilling job, when on closer examination the top of the hill is found to be formed in the shape of a V, which means that the earth has not been pushed up far

enough. Special care in doing this is necessary from the second hilling onwards.

Watering.

The aim of the irrigator should be to keep the plants in active growth. From the time the first watering is given until the last, the plants should never be allowed to suffer from the lack of moisture, since the production of maximum yields, and the quality of the crop grown under irrigation depends largely on the proper application and use of water. The quality of the crop is not injured by water if wisely and properly used. Light and often should be the maximum.

When furrow irrigation is to be practised, furrows should be made before the water is applied. The method by which these are formed has already been described. The type of furrow to be made depends on the type of soil, and the slope of the land. On flat land with heavy soils, the furrows should be deep and broad so that the water will not reach the top of the ridge, but may be forced quickly to the far end of the rows. If the land is steep or of a type which will wash badly, a small furrow should be used.

In some areas three or four applications of water will be enough, while in others five or six or even more may be given with advantage. Because of the variations in the water-holding capacity of different soils, and the influence of temperature, rainfall, and other seasonal conditions, it is impossible to prescribe a time when the first watering should be applied, the number of irrigations, and when the last watering should be given, but it is believed that the following general rules should be observed:—Apply first water when plants appear to require it to maintain maximum growth. If the seed bed were sufficiently moist at the time of planting it should not be necessary to water until the fifth week after planting. Once having applied the water, it is imperative that the soil should be kept moist by light or medium light waterings until a few weeks from harvesting. The farmer, with his own local knowledge, should master the frequency with which his particular field should be watered. The period varies between every ten to sixteen days, seldom longer. The ideal condition is to have all the soil, except the top of the ridge, continuously moist.

The adequacy of moisture in the soil may be determined by an examination of the soil 8 to 10 inches beneath the top of the ridge, by the condition of the plants, and by the colour of the foliage. Plants supplied with proper moisture should look vigorous, and have foliage colour typical of the variety. Lack of moisture in the soil causes the plants to wilt in the heat of the day, and they become dark and harsh; while an over supply of moisture causes the plants to assume a lighter colour than is normal for the variety.

Frequent light waterings of approximately 2 inches per watering are preferable to heavy waterings of 4 or 5 inches. If the overhead spray system is used the aim should be to give the plants a 2-inch watering at each application.

When furrows are used, the length of run is governed by the type of soil. It is a disadvantage to have water furrows more than 6 chains long, unless the lay of the land suggests an even watering at a greater length. The main thing to avoid is over watering one end in order to get sufficient water to the other.

Harvesting.

Potatoes should not be dug until the crop has come to maturity. Immature tubers scar easily, and unless handled very carefully make a poor appearance on the market.

When maturity is approaching—usually determined by yellowing and the drying off of foliage, about 13 weeks from planting—tests may be made periodically for ripeness. Usually, if the skin of the potato slips under pressure of the thumb maturity has not been reached. It is advisable not to delay harvesting after the potatoes have reached maturity, because of the prevalence of tuber moth. On the other hand, if potatoes are harvested too soon, apart from the appearance aspect already referred to, the maximum yield has not been obtained, since the greatest development takes place in the tubers during the last three weeks of growth. Harvesting should be completed when once commenced, with a minimum of delay, avoiding digging in fits and starts.

Mechanical diggers are usually used on large areas. These diggers lift the potatoes over the carrier chain, the process separating the tubers from the soil. Drill ploughs and vibrator diggers also are used. Care is required, however, in the adjustment of mechanical diggers to avoid injury. Tubers injured at time of harvest are likely to be attacked by dry rot or wet rot in storage.

In North Queensland potatoes should be picked up immediately after they are dug; otherwise, apart from the risk of tuber moth infestation, serious loss through scalding is likely to occur if the weather is warm. The great danger is that the injury is not usually apparent at the time, but shows up after they have been bagged for some hours. The process of decay then proceeds very rapidly, so that within a day or so a very large percentage of the bag will become a foul-smelling rotten mass.

Growers should grade carefully and avoid placing injured or affected potatoes in bags with sound potatoes. When full, the bags should be stitched at once, up-ended in the field, and the soil cast up around the stitched end. This forms a seal against moths. Potatoes should be removed from the field as soon as practicable.

More Power to the Land.

DEMONSTRATION OF MODERN FARM MACHINERY.

TO Mr. W. McCabe's farm at Bethania on 17th May came 500 information-seeking farmers from many parts of Queensland—from the Atherton Tableland and the coastal country around Cairns to the Granite Belt on the southern border and districts in between—to see for themselves modern farm machinery in action in the field.

The well-organised demonstration was arranged by the International Harvester Company, who had a team of experts in the field under the general direction of the manager for Queensland, Mr. Athol Blair. Of American design, much of the machinery was the output of the company's plant at Geelong, Victoria, and the product of skilled Australian workmanship. Watching the new machines at work, the dominant thought was that the engineer not only puts his skill and ability into adding to the national food supply, but enriches

agriculture by reducing manual work and improving the quality and distribution of the harvest. The agricultural engineer has surely demonstrated that the hard work of food production depends no longer entirely on the muscles of men and draught animals



Plate 147

GROUPS OF INTERESTED FARMERS GATHERED ROUND THE DEMONSTRATORS WHO EXPLAINED THE WORKS AND THE WAYS OF MODERN FARM MACHINERY

Linked appropriately with the nation-wide food production campaign, the field-day demonstration was of particular importance to farmers who have commenced vegetable growing on a large scale, and also to vegetable growers working small areas, to whom the new machinery may have an appeal if it is distributed through local co-operative farm machinery pools. Seen in action, both as single units and in combined operation, were three types of tractor-drawn ploughs, tandem disc harrows, four-row seed planters, four-row carrot-, bean- and maize-cultivating outfits, and a mower attachment to a tractor doing a fast and clean job in a standing crop of sudan grass.



Plate 148

A DEMONSTRATION OF EFFECTIVE PLOUGHING IN QUICK TIME.

The scene of operations was a rich stretch of alluvial land along a bank of the Logan River. The pioneers of these fertile acres had voyaged up the river by sailing cutter on the full run of the tide from Moreton Bay on a day back in 1864. Among the onlookers were descendants of those pioneers, still farming the land won from the jungle by their forbears 80 years ago.



Plate 149.

TRACTOR WITH 4-ROW VEGETABLE CULTIVATION ATTACHMENTS.

The new machinery included a modern "Farmall" tractor, a great all-purpose power unit, speedy and capable of turning within its own length, and to which may be fitted attachments for the preparation of the finest seed bed, sowing of the tiniest of seeds, clean cultivation of the smallest of row plantings and harvesting of the resultant crops. By the use of such equipment many more thousands of acres have already been brought under vegetable production at a period when time, as the



Plate 150.

NEW DEVELOPMENTS IN WEED CONTROL.—Farmers interested in new methods of crop protection as explained by Mr. C. W. Winders of the Department of Agriculture and Stock.

essence of the contract, has never been so significant. The "Farmall" is no ordinary tractor. It has a body shaped like a stream-lined belly petrol tank, set on a pair of high, massive rubber-tyred wheels with low-set twin wheels in front, and can be put to work at various speeds up to 16 m.p.h. Although designed primarily to serve wartime needs, the future of this new tractor-operated machinery on Australian farms is assured.



Plate 151.

A 2 ROW CULTIVATOR ATTACHMENT ADAPTABLE TO POTATO, TOMATO, AND OTHER ROW CROPS.

Generally the field-day demonstration at Bethania provided striking evidence of progress in agricultural engineering which, in combination with agricultural science, will ensure that the nation shall not starve. Associated with the machinery men were science men from the Department of Agriculture and Stock, who told each group of interested farmers how to protect their crops from pest and disease attacks between seed-time and harvest. So, apart from its primary



Plate 152.

MOWER ATTACHMENT TO A "FARMALL H" TRACTOR, WHICH CUT CLEANLY AND EFFECTIVELY THROUGH A STANDING CROP OF SUDAN GRASS.

purpose, the day's proceedings showed that with the farmer, the engineer and the man of science may also be regarded as producers of food and, therefore, among the most essential of the nation's workers. They are the production men who have organised the facts of nature into a power which multiplies the muscles of man in mankind's service and survival. They have, with the farmer, the answer to the age-old problem of feeding the hungry.



PLATE 153

A GENERAL EXCHANGE OF VIEWS AND OPINIONS ENDED THE DAY'S PROCEEDINGS.

From a practical point of view the Bethanna machinery field day was highly successful. From a social point of view it was equally so, for the Beenleigh Red Cross workers and Country Women's Association saw to that in their traditional way and with their traditional hospitality.



PLATE 154

PIST AND DISEASE CONTROL.—New measures and methods were explained to successive groups of interested farmers by Mr. J. A. Weddell, of the Department of Agriculture and Stock.

Machinery Demonstrated.

GL-171 Single Furrow Plough.—This implement, direct-connected to the tractor, is primarily for deep ploughing—to a depth of 12 inches where soil conditions permit. The plough is raised and lowered by merely pulling a trip rod, which sets the hydraulic mechanism in motion. It is not a stump jump plough, but has a safety device which operates if an obstruction is hit; if that happens, the beam simply breaks back.

“Little Genius” Plough.—This implement is designed to plough 6 to 8 inches deep, but shallower if necessary. It can be hitched to any type of tractor, and although not designed as a stump jump plough, it is protected by a safety release at the coupling point with the tractor. Another “Little Genius” type, also seen in action, has an additional beam and a narrowed cut for shallower ploughing.

Tractor Disc Harrow.—This is an improved tillage implement with cutaway disc to obviate the “balling up” of trash or weeds in front of the discs.

Mecher Levelling Harrow.—This implement is an Australian improvement on an imported model, so designed that necessary repairs may be well and cheaply done, and is entirely new to Australian vegetable culture. It is essentially a finishing tool in the preparation of a finely surfaced seed bed.

Planter Units.—The planter units have the Planet Jr type seed boxes. The planting mechanism is in plain view and under the immediate control of the operator. These units are built to plant four rows at a time, of both small and large seeded crops.



Plate 155.

YOUNG AUSTRALIA ACHIEVES HIS AMBITION.

Four-row Vegetable Cultivator.—This mechanism will cultivate from 18- to 28-inch rows on the flat and on each side of the tractor, row spacings can be cut down to 14 inches. In cultivating carrots with 18-inch row spacings it works very close to the row without pulling up the plants; it, therefore, solves an inter-row cultivation problem familiar to carrot growers.

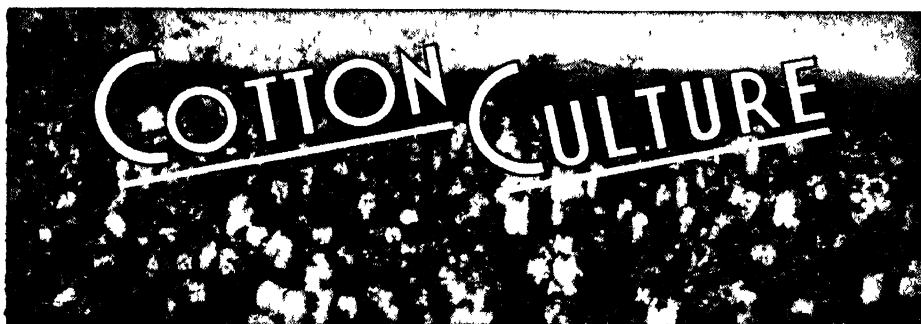
Two-row Cultivator.—This implement will cultivate any row crop from 28- to 48-inch row spacings. It takes in potatoes, tomatoes, maize, and other row crops grown with those spacings, and provides clearance up to about 30 inches. At that height a cultivating speed of 3 to 3½ m.p.h. can be maintained. Provision is made for vegetable bar attachments, enabling four rows to be cultivated at a time.

25-V Mower—This is a universal type mower, but with different couplings, which enables it to work with practically any type of tractor, it may be regarded, therefore, as a general purpose mower. Power is transmitted from the tractor, through a power take-off shaft to the power take-off coupling on the mower. Safety clutches and quick releases are provided to prevent damage to equipment if obstructions are encountered in the field.



Plate 156

A MILK PRODUCTION DEMONSTRATION ON A BRITISH FARM.



Commercial Cotton Varieties in Queensland.

R. W. PETERS, Research Officer.

(Continued from p. 213, April, 1944.)

Miller.

THE Miller variety is a big-bolled, medium-stapled American Upland cotton, which has been grown for many years in the United States of America. A new strain of it evolved in 1926 was introduced to Queensland in 1930. In the first few seasons' trials of Miller in this State, satisfactory yields were obtained but some difficulty was encountered in the harvesting operations through the locks of cotton sticking in the bases of the bolls. This tendency was eliminated, however, in the breeding plots and the variety is now noted for its easy picking qualities. Unfortunately, it has not been possible to evolve a satisfactory strain showing any marked superiority to the parent in regard to either a higher lint percentage or the elimination of the tendency to develop a considerable number of supplementary small vegetative branches when the variety is grown on fertile soil in a very wet season. It would also be beneficial if the variety was slightly earlier maturing. A comprehensive breeding programme aiming at improving the variety in these respects is being carried out in the Callide Valley—the district in which the greatest acreage of it is annually grown. An extensive breeding programme to evolve jassid-resistant strains of the variety has also been operating in this district along the lines described in the October, 1943, number of this Journal.

The yielding ability, size of boll, ease of picking, and the general tendency of the variety to produce high-grade cotton of a type required by the Australian spinners has made Miller popular whenever conditions are suitable for it, and it is the most extensively grown variety. Its popularity has also been increased by its partial resistance to the attacks of the leaf-sucking jassid, an insect which can cause serious loss of crop in cottons non-resistant to it. The average Miller plant is of medium size, with one to three basal vegetative branches which may be fairly large. The foliage is medium to large and dark-green in colour. The main axis is usually erect and slightly taller than Lone Star but not as sturdy. The fruiting branches are numerous but only of medium length. The fruiting arrangement is fairly open, which allows of good spacing of the bolls. Bolls are large, sixty to sixty-five to the pound, with a preponderance of five locks, which open well and are moderately stormproof. The fibres, which are of medium to full body, have a staple length of

1 inch and are very strong. The colour of the fibre is white. The lint percentage ranges from thirty-four to thirty-five.

The variety is recommended for the following soil types in the indicated districts:—

Northern Darling Downs and Maranoa—

The loamier soils of the rising lands and foothills of the Main Dividing Range, originally timbered mostly with box forests.

The more fertile loams of the belah flats.

The most moisture-retaining areas of the fertile red loams originally under either forest or scrub.

Southern District—

The soils of the slopes originally under scrub.

The more fertile loams to clay loams of the slopes originally under forests.

The less fertile clay loams of the alluvials.

South Burnett—

The black and the brown loams and clay loams of the lower slopes originally under silver-leaf ironbark forests.

The less fertile grey loams and clay loams of the lower slopes originally under good-sized box trees.

The fertile brown and red-brown loams and clay loams of the scrub series.

Central and Coastal Burnett—

Miller does not appear to be suited to these districts except on the decomposed granite soils in the Mount Perry-Boolboonda section of the Coastal Burnett.

Upper Burnett—

The soils of the slopes originally under box or ironbark forests.

The soils of the scrub series, especially where attacks by jassid are usually experienced.

Central District—

The soils of the forest series on either alluvial or slopes except the very fertile loams or sandy alluvial loams adjacent to creeks.

The soils of the scrub series.

Triumph.

This variety, which is known as Oklahoma Triumph in the United States of America, was introduced from that country in 1933. When it was first planted in Queensland it was obviously genetically impure as a wide range of plants could be seen in any well-grown field of it. Some of the plant types appeared very promising and the purification of the most attractive of them was, therefore, undertaken. Fortunately, the variety responded remarkably well to methods of improvement by individual plant selection, hence in a few years promising progeny increases were being tested and in 1938 the first improved strain was released for commercial distribution. Other improved strains of Triumph now available give definite promise of being important acquisitions to the

list of commercial cottons being grown in Queensland—mainly on account of their earliness, prolificness, and suitability for very fertile soils.

The following is a description of a typical plant of the main Triumph strains now being grown.

Main axis erect and of medium height but inclined to bend over when bearing a heavy top crop. There are generally one to three vegetative branches, but usually they do not develop vigorously. The fruiting branches are numerous, horizontal, and long on the lower part of the plant but shorten slightly higher up on it. The foliage is of medium size and dark green. Bolls are of medium size and occur roughly in equal proportions of five and four locks. Storm resistance is not good. The fibres average 15/16 of an inch in length, are of medium body, fairly good strength and of medium drag, while the percentage of lint ranges from thirty-four to thirty-five.

In a season when the planting rains do not occur until it is too late to plant the big balled, later maturing varieties, Triumph can be planted as late as December on all soils that are moderately fertile with good chances of obtaining a profitable yield. Triumph is also the only "safe" variety of cotton to plant on the most fertile alluvial loams in the wetter districts. It has been demonstrated that in areas which are regularly subject to jassid attack, early plantings of this variety can produce a satisfactory crop before the jassid population is sufficiently large to affect the growth of the plants. Another important feature of Triumph is its ability to develop a heavy crop after having received a setback caused either by insect activity or adverse climatic conditions.

The distribution of Triumph is very wide, in fact it is grown regularly in all of the most important cotton districts except the main sections of the Central District. The following soil types are recommended for the variety in the main cotton-growing districts south of Mackay.

Northern Darling Downs and the Maranoa—

The heavy black clays and clay loams of the mostly treeless plains. Early autumn ploughing is especially advisable for these soils so as to provide all possible subsoil moisture for this variety. It is also highly necessary to cultivate frequently on these soils to minimise the danger of severe cracking of them causing rapid loss of moisture.

The fertile loams and clay loams of the softwood scrub series.

The very fertile loams of the alluvial soils along the main creeks and in the folds and valleys of the Main Dividing Range.

Southern District—

The fertile loams of the alluvials of the main valleys—especially if irrigation facilities are available.

The fertile loams and clay loams of the first bench of either forest or scrub soils in the narrow side valleys entering the main valleys.

The most fertile of the loams of the softwood scrub series.

South Burnett—

The most fertile loams and clay loams of the alluvials—especially if irrigation facilities are available.

The fertile loams and clay loams of the softwood scrub series.

Central Burnett—

The fertile loams of the alluvials, especially if irrigation facilities are available.

The fertile loams and clay loams of the softwood scrub series.

The fertile loams and clay loams of both the forest and scrub series on the slopes in the general Dallarnil and Biggenden districts.

Coastal Burnett—

The fertile alluvial loams of the coastal plain.

The more fertile scrub and forest loams of both the slopes and the alluvials in the inland sections of the district.

Upper Burnett—

On soils similar to those recommended for the South Burnett.

Especially recommended for fertile alluvials where irrigation facilities are available.

Central District—

Recommended only for the fertile soils of the coastal section of this district. Also, in seasons of late planting rains, may be planted on the more fertile loams of forest and scrub series of inland sections of the district. Not recommended for early planting in these latter sections of the district.

New Mexico Acala.

This strain of Acala was introduced into Queensland in 1934, from the Field Station of the United States Department of Agriculture, State College, New Mexico. Starting with the first year of testing under Queensland conditions, the variety has been remarkable for its uniformity of characters and although "New Place Effect" has subsequently caused some slight variation of characters, it still retains a good standard of uniformity. In fibre qualities it is one of the outstanding varieties grown in Queensland, characters as body, drag, lint percentage and lint index all being of a very high standard.

The plant is of medium height with a strong, erect main stem. Basal vegetative branches generally vary from one to three, with one usually being of vigorous growth. Fruiting branches are somewhat short jointed, with the lower branches long, while the upper ones become short towards the apex of the plant. Leaves are medium to large in size and dark green in colour, with the lobes being mostly long and pointed. Bolls are of medium to large size, ovate to ovate oblong in shape with a rather short blunt point and weigh 50-60 per lb. The bracts are rather small for an American Upland type. The bolls are often pendent, open wide and have good storm-proof qualities. Lint has an average length of 1 to 1.1-1.6th inch with good drag and strength, is usually heavy bodied, clear white in colour and the percentage of lint averages 37 in well-grown cotton. In the shape of the plant, the type of boll and in the quality of the lint, New Mexico Acala is distinct from all other varieties grown in Queensland. It matures earlier than other big balled cottons and has the ability to mature much of its crop at once.

New Mexico Acala has replaced all other strains of Acala grown in Queensland. Unfortunately it is extremely susceptible to attacks from jassids which limit its sphere of usefulness in areas where this pest

occurs. It also does not appear to be able to withstand adverse conditions as well as either Lone Star or Miller, both of which are coarser bodied cottons. A comprehensive breeding programme is therefore being carried out in the variety aiming at both increasing its jassid resistance and obtaining a slightly more drought resistant type.

The variety is recommended for the following soil types in the indicated districts:—

Northern Darling Downs and Maranoa—

The loamier soils of the dark brown clay loams of the forest series.

The clay loams of the alluvials where irrigation facilities are available.

Southern District—

Results obtained so far in trials have appeared to indicate that the variety has only limited possibilities in this district.

South Burnett—

The dark brown clay loams of the lower slopes originally timbered with silver leaf ironbark.

The less fertile heavy clay loams of lower slopes and alluvials originally under box forest, more particularly in the first three seasons after the breaking up of grassland.

Central and Coastal Burnett—

Not recommended for these districts.

Upper Burnett—

The loams and clay loams of the alluvials in the southern section of the district. Not recommended for the northern half as the soils are too fertile and jassid attacks are frequently experienced.

Central District—

The fertile loams and sandy alluvial loams of the forest series adjacent to creeks in all but the coastal section of this district. The variety appears to be particularly suitable for growing with supplementary irrigation, and has largely replaced Miller on the Theodore irrigation project.

Farm Relief.

This variety was introduced from the United States of America in 1930. It is slightly earlier than New Mexico Acala, and when grown well is a most attractive cotton, the plant being of an open symmetrical habit with good internode space between both fruiting branches and the bolls. Unfortunately, the variety requires ideal growing conditions, under which excellent yields of good quality cotton have been obtained.

Plants are fairly tall, with a strong main axis, basal vegetative branches usually two to four, two being moderately vigorous in growth. Fruiting branches are long, gradually shortening towards the apex of the plant, and tend to be horizontal, which, with the good spacing of the internodes on both the main stalk and branches, gives the plant a very open appearance even when tall. Foliage is medium to large, dark green in colour. Bolls are medium to large and open well with fairly good

storm-proof qualities. Fibre has a staple length of 1 1-16th inch. The strength is medium while the drag is good. The character of the fibres varies somewhat, and breeding work is under way in the variety, aiming at improving the character of the fibre yet retaining the dominant attractive habit of growth.

When grown under ideal conditions the variety is most prolific. Its distribution is decidedly limited, however, on account of its inability to withstand any harsh growing conditions. Under such treatment the fibre is weak and wasty, but under irrigation the variety has produced excellent yields of high quality cotton on moderately fertile clay to clay loam alluvials. It is therefore confined to this class of soil in the Southern district, and the South and Coastal Burnett districts.

Other Varieties being Tested in Queensland.

In addition to the five main varieties which have just been described, the Cotton Section of the Department of Agriculture and Stock has under investigation a number of other varieties which have more recently been imported. As the full possibilities of these cottons become more understood, the most promising of them will be tested in a comprehensive set of district trials to ascertain their merits as compared with the main varieties grown. Any of these newer varieties showing superiority in the district tests will be multiplied sufficiently to enable a limited number of farmers to grow them commercially. If the general results obtained in these large scale trials also indicate one of the newer varieties to be superior to the varieties now grown, seed stocks of it will be increased as rapidly as possible for general distribution in the district concerned and a breeding programme will be inaugurated to maintain the variety on a high standard of performance.

In Memoriam.

A life of achievement and service to Queensland ended with the death of the Hon. Digby Frank Denham on 10th May at the age of 85. The late Mr. Denham was Premier of the State from February, 1911, till June, 1915, and had previously held the portfolio of Minister for Agriculture and Stock. Born at Laneport, Somerset, England, in 1859, he came to South Australia in 1881 and to Queensland five years later, and established a business which subsequently became Denham's Proprietary, Ltd. In 1893, with the late J. C. Hutton, and in association with the late John Reid, he started butter and cheese factories on the Darling Downs. In 1902 he entered the State Parliament as member for Oxley. To the end he remained a man of high-minded and loveable nature, full of imaginative fire, force, and sincerity.



Fruit Growing in Tropical Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

ALTHOUGH North Queensland is situated well within the tropics, there are very few fruits which cannot be grown successfully in at least some portion of that region. In the course of a recent casual tour of one northern city over thirty species of fruits, both tropical and temperate, were found growing in home gardens. However, while this may be successfully accomplished under garden conditions, the commercial growth of various fruits is practicable only in localities most suited to the particular species. Tropical fruits and citrus are grown successfully over the long coastal strip from Cooktown to Bowen; citrus and grapes thrive in the inland district of Charters Towers; and grapes and plums are grown around Herberton and Ravenshoe on the Atherton and Evelyn Tablelands. In this vast territory there is, of course, a wide range in climatic conditions, so the right species of fruit for a particular locality should be selected.

In dealing with a subject covering such a broad field as this, it is not practicable to enter into detailed information on each fruit in each locality. It is proposed, however, to deal briefly with the more important fruits, stating the districts in which they are chiefly grown, and the advantages and disadvantages attendant on their culture. While only certain districts will be mentioned, it does not follow that these are the only districts in which such fruits are grown or can be grown. It means only that they are the present principal centres of production for those fruits.

The principal commercial fruits grown in North Queensland are citrus, pineapples, bananas, papaws, mangoes, granadillas, and grapes. Those of lesser importance are passion fruit, plums, litchis, persimmons, avocados, and sugar apples. In addition, very many little-known tropical fruits are represented by odd specimens, but seldom marketed.

Citrus.

District centres of commercial production of citrus fruits are Cooktown, Cairns, Cardwell, and Charters Towers. Of these districts, both Cooktown and Cairns were large and well-known producing areas thirty years ago, but in recent years have receded somewhat from their leading position in the industry. At Cooktown, isolation from markets has had a deterrent effect on production, but citrus production continues to a limited extent. Cooktown has an even climate, but usually experiences a dry spring and early summer, which retards the flowering of trees.

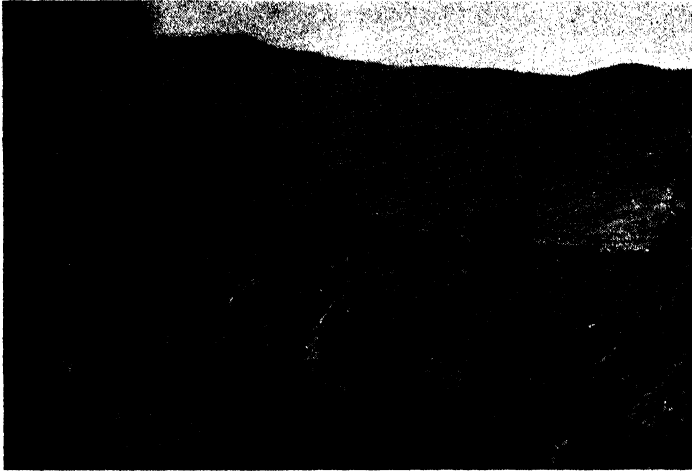


Plate 157.

A TYPICAL BANANA PLANTATION IN NORTH QUEENSLAND.

The result is a late-ripening crop, which because of its lateness is sold on local markets. At Cairns, the extensive industry of some years ago has given way to the more stable sugar industry, but considerable quantities of citrus fruits are still produced for local trade. Of the other two large producing centres, Cardwell is well and favourably known for its mandarins, and Charters Towers for its oranges. Cardwell's reputation is based on the Emperor variety of mandarin, which grows there to perfection. Charters Towers oranges are of several varieties, viz.:—Washington Navel, Joppa, Jaffa, and Valencia Late; irrigation is an essential of fruit growing in this district.



Plate 158.

BANANA GROWING ON ALLUVIAL FLAT LAND.—Note cultivation by horse-drawn implements.

In some districts, notably the dry area from Townsville westwards, foliocellosis is often present in citrus. Treatment with zinc sulphate

spray has produced good results in control. Seedling trees are largely grown in the wet coastal areas, and appear to be definitely hardier than budded trees, generally to be longer lived, and frequently more resistant to scale pests and disease under the conditions prevailing. The seedling orange and mandarin produced are of good quality and juice content, but are usually many-seeded. Furthermore, they usually ripen in the middle of the citrus season and so are often delivered on an over-supplied market.

A general varietal recommendation for citrus to cover an extended season in the various districts is:—(1) *Coastal areas*, White Siletta, Joppa, and Valencia Late oranges, Emperor and King of Siam mandarins, Marsh Seedless grape fruit. (2) *Inland* (Charters Towers), Washington Navel, Joppa, Jaffa, and Valencia Late oranges, Emperor, Ellendale Beauty, and King of Siam mandarins, Lisbon and Villa Franca lemons.



Plate 159.

PINEAPPLES IN NORTH QUEENSLAND.—Note the ground cover crop of Townsville lucerne (*Stylosanthes sarda*) to prevent soil erosion.

Pineapples.

District centres of pineapple production are Cairns, Magnetic Island, Ayr, and Bowen. Around the northern centre, Rough Leaf variety is grown almost exclusively; at Magnetic Island, Rough, Ripley, and Smooth are all grown; at Ayr and Bowen, Smooth Leaf is the chief variety. Harvesting of the main crop around Cairns commences early in October and extends to December. In the other districts, harvesting is progressively later—Magnetic Island commencing in November, and the other districts in December. A winter crop is produced during the period from April to June, but it is considerably less in quantity than the summer crop. Local markets consume a fair portion of the production, but a considerable quantity also is forwarded to the southern fresh fruit markets. Processing of the fruit is not practised in the North.

Bananas.

The banana is now grown on a small scale only. Plantations occur over the whole coastal area from Cooktown to Bowen, and on the Atherton Tableland. In the tropics, this crop is only grown successfully on

low, alluvial flat land. Many plantations ten years old or more are to be found on this type of land still producing good fruit; while hillside plantings have generally failed after producing a single crop. In the drier areas of the North, irrigation is practised on a number of plantations. On cleared land, horse- or tractor-drawn implements are used in cultivation; but on newly-cleared stump land, hand implements are necessary. Cavendish is the principal variety, but some small areas of Sugar and Gros Michel have been planted. Generally, the first mentioned is the most satisfactory commercial variety.



Plate 160.

"KENSINGTON" MANGO IN FULL BLOOM.—Illustrating profuse cropping habit.

Papaws.

Papaw production is confined chiefly to the Cairns and Townsville districts. Planting in the heavy rainfall area cannot be generally recommended, as the plants are very susceptible to "wet feet." Papaw soils should approach neutral in reaction, and should be free, deep, and well drained, yet with ample moisture always present. If the soil is acid the addition of lime—up to as much as 3 tons per acre—is necessary. The plant is a vigorous grower and a voracious feeder, so where soil is not rich, fertilizer must be applied. The bisexual varieties are largely grown, the type known as "Long Tom" or "New Guinea" being the ones most favoured. Good fruit of this type is about 12 to 15 inches in length and has thick flesh of a rich orange colour and fine flavour. There has been considerable degeneration in papaw varieties, however, and some

plantations show evidence that systematic roguing of poor types would be beneficial. The need for care in the selection of seed is obvious.



Plate 161.

(GRANADILLA "SHED.")—Showing young vine and construction of trellis.

Mango.

The mango grows and fruits prolifically in every part of the North outside the heavy rainfall belt. In many areas, however, only the common stringy types are grown, and apparently little effort has been made to improve the quality. Fibrous types are of little value on the fresh fruit market, and should be used only for processing. Good commercial types are grown around Bowen and on Magnetic Island. These districts are becoming noted for several fibreless types of high quality, and for which there is a ready market. Seed of many of the good types do not always reproduce the high quality of the parent, and as this is the only method of propagation so far practised by growers, it



Plate 162.

A. NORTHERN VINEYARD.—The wire-netting "umbrella" is a protection against predatory birds.

probably accounts very largely for the indifferent quality of the fruit offered for sale. Experimental vegetative propagation is now being carried out by the Department of Agriculture and Stock, and it is hoped that this method will soon supersede the old method of raising from seed, and so result in a general improvement in mango varieties.

In the regions of heavy rainfall the mango grows profusely, but rarely fruits well. The prevalence of anthracnose fungus in these districts is usually the cause of crop failure.

Granadilla.

Two varieties of granadilla are grown, viz. :—The large-fruited and the small-fruited. The plant is a climber of vigorous habit belonging to the passion fruit family. It is customarily grown on a horizontal overhead trellis supported on posts about 7 feet above ground, known as a granadilla shed. Like other passifloras, the fruit is produced on new growth, so regular annual pruning of vines is necessary to ensure vigorous and prolific new lateral growth.

The small-fruited variety is the one most favoured for commercial production, as it crops heavily under natural pollination. The large-fruited type is equally vigorous in growth and profuseness of flowering, but generally requires hand pollination to obtain good fruit setting.

Grapes.

The vine is cultivated in the Charters Towers and Herberton districts, the former being the chief producing area. In Charters Towers, the varieties most favoured are Royal Ascot and Muscatel. The fruit comes on the market before grapes from South Queensland reach the North in quantity, hence meets a ready demand. In the Herberton district, winter conditions are rarely sufficiently continuous to enable high-class European varieties to be successfully grown so in this area attention is concentrated mainly on the American varieties, those giving best results being Isabella, Goethe, and Ferdinand de Lessop. Muscatel, however, gives very fair results in some seasons. Fruit from this area finds a ready sale in the immediate district, and there is seldom any surplus for export to other districts.

Other Fruits.

Of the fruits of lesser importance, passion fruit grows readily in the coastal area and on the Atherton Tableland; in fact, it is a common natural growth in many of the jungle areas. Under cultivation, however, it is very subject to a base rot which frequently kills the vine before or immediately after the first crop.

Plums and persimmons are grown in the Herberton district, but both are subject to heavy attack by fruit fly, while the persimmon does not appear to be a popular fruit on local markets.

Litchis are grown mainly in the Cairns district, but difficulty in obtaining marcotted trees is retarding expansion. Seedling trees are unreliable in quality and fruiting habit, and, moreover, require 15 to 18 years to crop. Kwai mee and Wai chee varieties are at present giving best results.

The Avocado is not yet widely grown in the North, and is little known on northern markets. Present orchards are very restricted in

size and number, and are mainly planted with seedlings, which, under favourable conditions, commence fruiting at four years of age.

The Sugar apple is a common tree in most settled areas of the North as an escape from cultivation. It is cultivated in small areas in various parts of North Queensland. The tree is variable in habit because of the common method of raising from seed, but good types fruit heavily. The fruit is very sweet, but is many-seeded; it ripens rapidly on reaching maturity, and this habit makes it an unsuitable subject for extensive commercial growing.



Plate 163.

AN ENGLISH FARMER ROLLS A FIELD BROKEN UP AFTER A CENTURY OF GRASS.

VEGETABLE PRODUCTION

The Need for Boron in the Nutrition of Vegetable Crops.

A. A. ROSS, Assistant Research Officer.

RECENT investigations have shown that boron plays an important part in regulating growth processes in plants and that this element is of particular importance to the reproductive organs. It is also claimed that boron controls the use of nitrates, phosphates, and calcium. As an example, boron-deficient sugar beet plants accumulate large quantities of nitrates, and the opinion has been advanced that the form which boron deficiency takes in this case is really an expression of nitrate poisoning. It is obvious, at least, that boron exercises a very complex and important influence in plant nutrition and that it must be included among the elements made available to plants through the soil.

Instances of boron deficiency have appeared on several of the vegetable-growing soils of south-east Queensland, but effective correction of the unsatisfactory forms of growth associated with this deficiency has been accomplished by the addition to the soil of boron in the form of borax. The trouble has been experienced mostly in crops of beetroot, although several cases of white turnips, swedes, and cauliflowers suffering from the complaint have also been encountered.

Symptoms in Beetroot.

Insofar as beetroot is concerned, girdle disease, black spot, or heart rot are names commonly applied to this disorder. However, as girdling is the symptom most frequently displayed in this State (Plate 164), "girdle disease" seems the most appropriate of the three names. The disorder first manifests itself in the largest plants in a crop and in those that are developing most rapidly. It is common, then, to find that the later a crop is left before harvesting the greater will be the incidence of girdling. Symptoms are most pronounced in the "root," which may be partially or completely encircled by dark, sunken, corky areas, developing at or below ground level (Plate 165). These lesions are frequently invaded by a fungus which imparts a greyish colouration to the affected area, and such "roots" are badly disfigured and rendered unfit for market. In some cases the most obvious symptom is the occurrence of black, corky spots in the interior of affected "roots," and these may, or may not, be accompanied by surface girdling.

Foliage symptoms are not reliable in diagnosing this disorder as, at times, an apparently normal top may be associated with a "root" showing girdling. However, when foliage symptoms do appear, the

youngest leaves are affected first. Long, narrow, and slightly cupped leaves are then produced, and sometimes only one-half of the blade is developed. In later stages leaves turn yellow prematurely. At times multiple crowns are produced, rosettes of small leaves appearing at several points around the original crown. These small leaves tend to die back from the tip, and ultimately drop off. It has been shown that where beetroot plants have been grown for seed those showing symptoms of boron deficiency in their first season fail to produce seed in the normal manner in the second year.

Symptoms in White Turnips and Swedes.

When the trouble occurs in white turnips and swedes the symptoms in general are similar to those occurring in affected beetroot crops. In mild forms of the disorder abnormality shows only internally in the "root," and the disease is then appropriately named "brown heart" because of the characteristic greyish-brown colouration, which is developed in the centre of the "root." Where the deficiency is acute, foliage symptoms present themselves, and a certain degree of roughness can be discerned on the surface of the root; leaves become distorted, yellowed, and mottled with a purplish tinge round the margins, and the leaf stalks frequently split; multiple crowns also occur (Plate 166). In severe cases the diseased tissue in the centre of the "root" collapses, and this collapse is followed by the entry of organisms which produce a soft rot accompanied by a foul odour; the centre of the "root" finally becomes hollow. As with beetroot the trouble first develops and becomes most severe in the largest plants in the crop. In all cases, even where only slight browning is in evidence, the "roots" develop a stringiness which becomes more pronounced on boiling.



Plate 164.

GIRDLING ON BEETROOT.—A symptom of boron deficiency.

Symptoms in Cauliflowers.

Until the curd begins to form no external symptoms of boron deficiency are developed in cauliflowers. The first sign of the disorder in this vegetable is the appearance of small water-soaked areas in the centre of the main stem and small branches of the curd; in later stages, the stem becomes hollow with water-soaked tissue surrounding the walls of the cavity (Plate 167). The first external symptom is the appearance of distorted inner leaves, which may be so reduced as to consist only of the mid-rib; in more advanced stages, pinkish or rusty-brown areas, to which the name of brown rot or red rot is applied, develop on the surface of the curd. Browning of the curd does not always accompany the hollow stem, but, in severe cases, both symptoms are invariably present. Ultimately, decomposition organisms produce a foul-smelling rot, and the head is rendered completely worthless (Plate 168). Affected heads develop a bitter flavour, which persists after cooking.



Plate 165.

GIRDLING AND MULTIPLE CROWNS ON BEETROOT.—Symptoms of boron deficiency.

Relationships Between Boron and the Soil.

Whilst boron deficiency is most pronounced on alkaline soils it may also occur on acid soils. In south-east Queensland it has been found on acid soils where the pH ranges from 5 to 6. Liming has the effect of accentuating the trouble or of inducing it on soils in which the supply of available boron is low. The exact nature of the effect of liming is not completely understood, but the intensification of the trouble appears to be the result of the change in soil reaction rather than of the increase in soil calcium. However, one possible explanation is that lime may have the effect of rendering the boron unavailable to some extent, or it may be that the increased growth induced by the addition of lime to an acid soil

may make a greater demand on the supply of boron present, thereby emphasising the deficiency. It is also possible that one effect of lime on micro-organisms is to increase their use of boron. Whatever the explanation may be, it is known that the addition of lime to the soil does increase the trouble and that such a deficiency induced by lime can be rectified by the application of suitable boron compounds to the soil.



Plate 166.

MULTIPLE CROWNS ON WHITE TURNIPS.—A symptom of boron deficiency.

As is usually the case with deficiency diseases, the incidence of the disorder tends to increase under drought conditions. It is only reasonable to expect that the availability to the plant of an element would be reduced under conditions of low soil moisture and that this would be particularly important in the case of elements such as boron, which are normally present in the soil in very small proportions. It must always be borne in mind that regularity of soil moisture supply throughout the growing period of the crop is of greater importance than the total amount of water. Thus, soils of low moisture-holding capacity, especially where the physical condition is poor, shallow soils with a compact subsoil, and soils made shallow by the presence of a hard pan

are particularly liable to produce the trouble as the result both of irregularities in water supply and of restriction in root growth.

Boron deficiency is most commonly found on light-textured soils in regions of heavy rainfall, but, because of their low capacity to fix this element and thus make it unavailable to plants, the trouble on this type is more easily rectified than on heavy coarse-textured soils.

All plants absorb a certain amount of boron, and in many vegetable crops this represents a heavy loss to the soil as much of the element is stored in those parts of the plant which are sent to market. When such crops are grown regularly it is obvious that some replacement of boron should be made.

Results of Experiments.

Trials involving the application of boron have been conducted in the Sunnybank and Brookfield districts. Girdle disease of beetroot was prevalent in the Sunnybank district, and investigations were commenced to establish the cause of the trouble and to demonstrate an effective control. A site was selected where the disorder had appeared in the previous season, and a randomised block experiment of four treatments replicated six times was laid down. The soil reaction was pH 6.0. The dressings given comprised 20 lb., 40 lb., and 60 lb. of borax per acre, and a no-treatment control was included. The borax was applied in one application when the plants had reached a height of about 1 inch. The required amount of borax for each plot was dissolved in four gallons of water, and applied along the rows of plants by means of a watering can, thus ensuring a very uniform distribution. Cultural practices such as fertilizing, cultivation, and irrigation were the same on all plots, and were those normally practised by the grower. At the time of harvesting a count was made of healthy and affected plants, the results of the count being as follows:—

	Healthy Beetroot	Affected Beetroot	Percentage Affected
1 Borax—60 lb. per acre	1,079	73	6.3
2 Borax—40 lb. per acre	1,096	78	6.5
3 Borax—20 lb. per acre	1,060	69	6.1
4 No treatment	825	311	27.3

From the above figures it can be seen that borax produced a considerable reduction in the incidence of the disorder, but there were no significant differences between the results obtained with the various amounts of borax. In other words, 20 lb. per acre was sufficient to effect a control, while heavier treatments of up to 60 lb. per acre did not produce any injury. Complete control was not effected by any treatment, and this suggests that other factors, such as time, and method, of application, required attention. In addition to providing a definite diagnosis of the trouble this trial demonstrated the symptoms which may be taken as being representative of boron deficiency in beetroot.

At Brookfield, cauliflowers exhibited symptoms which closely conformed to those which occur in boron-deficient plants. As symptoms of this trouble in beetroot could be recognised with certainty, a trial was conducted during the spring, using beetroot as an indicator crop, in order to obtain the required information before the next crop of cauliflowers

was due to be planted. A randomised block experiment of six treatments replicated four times was laid down. This included three levels of borax, manganese chloride, zinc sulphate, and a no-treatment control. All materials were dissolved in water and applied by means of a watering can along the rows of plants. The soil reaction in this case was pH 7.05. The total number of plants, the number of plants affected, and gross weight of plants per plot were recorded on harvesting. The treatments and the chief results obtained were as follows:—

	Healthy Beetroot.	Affected Beetroot.	Percentage Affected.
1. Borax—20 lb. per acre	783	7	.94
2. Borax—10 lb. per acre	741	13	1.73
3. Borax—5 lb. per acre	787	15	1.88
4. Manganese chloride—20 lb. per acre ..	636	38	4.94
5. Zinc sulphate—20 lb. per acre	715	62	7.99
6. No treatment	704	52	6.46

There were no differences between the average weights of plants produced as a result of the various treatments, and these are therefore not shown in the above table.

These results show that borax reduced the incidence of the disorder, but again there were no significant differences between the effects of the various levels of borax, and the upper level, i.e., 20 lb. per acre, did not produce any injury. On this area the incidence of the disorder on untreated plots was much less than in the Sunnybank area, which partly explains the more complete control effected. The trial served to indicate that the soil was deficient in boron, and that in crops of cauliflower, beetroot, white turnip, and cabbage grown on it improvement could be expected as the result of applications of this material.

Treatment of Deficient Soils.

The only means of controlling boron deficiency disorders is by applying a suitable boron compound to the soil. Commercial borax is satisfactory and is a substance which is usually easily obtained. Boric acid is also a common material, which is equally suitable. It must be remembered, however, that for this purpose 7.7 parts of boric acid is equivalent to 12 parts of borax, and quantities must be proportionally adjusted when boric acid is used in place of borax.

Whilst it is advisable that boron be applied to the soil before planting or before transplanting seed-bed-raised crops, applications after the plants have become established are also successful. Any practical method which will make an even distribution of the small amount required may be employed; thus it may be combined with the fertilizer, diluted with a carrier such as kaolin, or dissolved in water; it may be applied in the drill, at the sides of the drill, or broadcast. A 2 per cent. solution in water applied to the soil and foliage with a watering can or knapsack sprayer will prove effective.

As the amount to be applied varies with the crop grown, the soil reaction, the soil type, and the degree to which the soil is deficient, it is not possible to make any general recommendations as to the rate of application. For the more boron-sensitive plants reduced quantities will have to be used to avoid toxicity. Table 1 serves to indicate the

degree of tolerance to boron exhibited by various crop plants, and gives a guide to the quantities of borax to apply. Maximum quantities which can be applied without producing injury are given, but satisfactory control can usually be obtained from smaller applications.

TABLE 1.

<i>Very Sensitive.</i>	<i>Sensitive.</i>	<i>Tolerant.</i>	<i>Very Tolerant.</i>
Maximum ; 5 lb. Borax Per Acre.	Maximum ; 10 lb. Borax Per Acre.	Maximum ; 20 lb. Borax Per Acre.	Maximum ; 40 lb. Borax Per Acre.
Bean Cowpea Cucumber Strawberry	Celery Pea Potato Rockmelon Squash Watermelon	Cabbage Carrot Lettuce Onion Radish Sweet Potato Tomato	Beetroot Cauliflower White Turnip Swede



Plate 167.

HOLLOW CENTRE OF CAULIFLOWER.—A symptom of boron deficiency.

On some soils, the results of boron treatment may be as effective in the second season as in the season of application, but from what is known of the availability of boron, it is considered better to apply smaller amounts each season than larger amounts to cover requirements for two or more seasons.

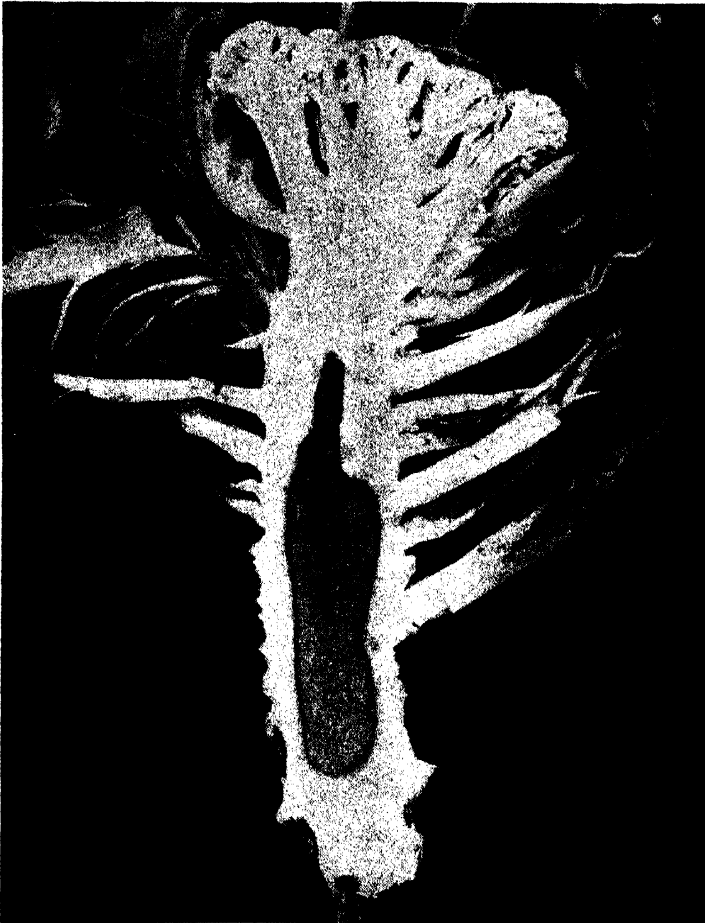


Plate 168.

HOLLOW CENTRE AND INTERNAL ROTTING OF CAULIFLOWER.—Symptoms of boron deficiency.

Boron Toxicity.

Under natural conditions, boron toxicity is not liable to occur, except in very arid regions, and in practice is usually found only as the result of excessive boron applications. The boron requirements of different species of plants vary considerably, and, in general, those most readily affected by a deficiency are not injured by amounts which would be toxic to other less tolerant species. On field trials, dosages of 200 lb. per acre have proved lethal to most plants, while the more susceptible species have been injured by as little as 5 lb. per acre.

Should boron accumulate in the soil to the extent of becoming toxic the growing of tolerant crops is perhaps the most effective way of reducing the concentration of boron in the soil. Heavy irrigation with a water

free from boron tends to decrease the concentration of boron in the soil solution, and also leaches out some of the soluble boron. In acid soils the uptake of boron may be inhibited to some extent by the application of lime.

Generally, the symptoms of boron toxicity develop first in the leaves, as it is in these organs that the greatest accumulation of the element takes place. In crop plants, symptoms are generally very similar in all species. Initially, yellowing begins round the margins of the leaves, and then extends between the lateral veins towards the mid-rib. There is a tendency for the green colour to be retained towards the centre and base of the leaf until it falls. If the leaf is still growing, the margins turn yellow and die, while the centre continues to grow, thus producing a cupped leaf with dead tissue round the margin. It is usual for injured leaves to fall prematurely.

Spraying Weeds in Carrot Crops.

C. W. WINDERS, Assistant Research Officer.

Kerosene Weedkiller.

THE hand-weeding of carrot crops within a few weeks of germination is perhaps the most costly and laborious operation in growing the crop. The discovery in America that certain oils could be used to destroy young weeds without damaging the carrots has been followed up in Australia, and as a result a weedkiller is about to be marketed for the express purpose of eradicating the early weed growth. This weedkiller, to be known as "Pool Kerosene Weedicide," will be procurable in 44-gallon drums only, from the Brisbane depots of Pool Petroleum Pty. Ltd., whose offices are in Orient Line Building, Eagle street, Brisbane.

For some months past power kerosene has been used undiluted on carrot crops, with variable results. On some occasions it has been entirely successful, but some lots proved extremely harmful to the carrots as well as to the weeds. The new weedkiller has power kerosene as its basis, but is specially prepared and tested in order to ensure that its content of weedkilling compounds is below the figure which agricultural authorities regard as being dangerous to carrots.

Time to Spray.

There is a limited period during which carrots may be sprayed safely with kerosene weedkiller. This extends from the stage at which the carrots have two "fern" leaves to the stage where four "fern" leaves are present. If the spray is applied before the two "fern" leaves appear the carrot seedlings may be killed; if the carrots are sprayed after the four-leaf stage there is a definite danger that a kerosene taint will persist in the carrots and render them unfit for consumption. Only one spraying should be given.

During the cooler months of the year, the time of the day at which spraying is carried out should not have any great effect on the efficacy of the spray, but in the warm weather it may be desirable to spray in the cool of the evening in order to reduce evaporation of the kerosene to a minimum.

Quantity to Use.

Only sufficient spray to cover the weeds with a film of liquid should be used. Heavier applications, in addition to being wasteful of weed-killer, may cause injury to the carrots. An application of 80 gallons per acre of area actually wetted should suffice—that is, 4 gallons of spray should cover 66 chains of row sprayed in a strip 6 inches wide, which is equivalent to 27 gallons on an acre of carrots in rows spaced 18 inches apart. The nozzle used should have a fine jet and should preferably deliver a fan-shaped spray. The ordinary nozzles used on power and knapsack outfits may be used if the special type of nozzle is not available, but they will use more kerosene spray to cover the same area. Either the power or the knapsack spray pump may be used. Kerosene weedkiller will destroy practically all the weeds commonly encountered in southern Queensland in the autumn months, but its effect on some of the summer-growing weeds has yet to be tested.

Carrot Crops Only to be Sprayed.

Members of the carrot family are the only vegetable crops known to possess resistance to injury by kerosene weedkillers, and these materials should not be used for the present on any crop but carrots. It is probable that parsnips can be sprayed satisfactorily, but details of the required strengths and time of application are not yet known.



Plate 169.

HAULING HOME-GROWN TIMBER FROM AN ENGLISH FOREST.

APPLIED BOTANY

The Algaroba Bean or Mesquite as a Pest Plant.

C. T. WHITE, Government Botanist.

THE importance of the algaroba (*Prosopis juliflora*) as a fodder tree in Hawaii led to its introduction into Queensland many years ago. Professor J. F. Rock, the famous botanist, who for many years resided in Hawaii, described it as by far the most common as well as the most valuable of the introduced trees of the Hawaiian islands. Land which, prior to the introduction of algaroba, was absolutely barren has been covered with dense forests of algaroba, which not only supply excellent firewood but furnish flowers with nectar, valuable for honey-making, and produce pods, which are eaten by all classes of grazing animals. Algaroba is regarded in Hawaii as the most valuable forage plant in certain parts of the Territory.

However, in parts of the United States—particularly in the States of Texas, Arizona, and New Mexico—algaroba, or mesquite as it is known there, is regarded as a serious pest of grazing country. As conditions in those areas are closer to those of the pastoral land of northern and western Queensland than are Hawaiian conditions, the Department of Agriculture and Stock has opposed the planting of algaroba in the pastoral districts of the State. Recent publications issued in the United States have emphasised the growing importance of mesquite as a pest and the difficulty of reclaiming land invaded by the plant. For example, it is stated in a recent number of "Soil Conservation," the official organ of the United States Soil Conservation Service, that the destruction of mesquite on Texas Ranges (*i.e.*, pastoral country) is one of the major problems of that area. The steady increase of the trees and bushes of mesquite has gradually and materially reduced ranch income, lowering the State's potential meat production for the war effort. It is estimated that on land where mesquite is growing it requires from 12 to 100 acres to maintain a cow or its equivalent, the area depending upon the degree of infestation. When average figures are applied to areas in Texas, the possible production on the mesquite-covered area is 2,368,421 cows or their equivalent, whereas if the mesquite were removed and normal grazing capacity restored the number would be 3,750,000. Expressed in beef production, this would represent over 50 per cent. increase. Eradication work, whether by hand-grubbing, by chemical methods, by the use of tree-dozers, or by the use of a mobile circular saw followed by swabbing, is relatively costly.

Officers of this Department who are familiar with infested areas in the United States have always been afraid that the algaroba, once introduced, might get out of control and spread in the pastoral districts, particularly along western river channels, leading to reduction in carrying capacity. The information quoted above should suffice to justify the caution which the Department has exercised. Enough pests have been introduced unwittingly without encouraging what may well be regarded as a potential serious pest.

ANSWERS.

Yellow Daisy—A Plant Poisonous to Sheep.

G. B. (Bookin Siding, Cloncurry Line)—

The specimen is *Wedelia asperima*, commonly called the yellow daisy, a plant very widely spread in North Queensland and the Northern Territory. Feeding tests have shown this plant to be poisonous to sheep, causing symptoms similar to those of pneumonia.

Rivina—A Milk-tainting Weed.

S.E.P. (Rockhampton)—

The specimen is the Rivina Weed (*Rivina humilis*), a native of South America, now a common naturalised weed in Queensland. It is particularly abundant in Central Queensland, especially around scrub edges, along fences, and similar places. It is one of our worst milk-tainting weeds, but so far as known has not previously come under suspicion as tainting flesh, but this is quite likely.

Nut Grass.

T.R.F. (Urangan)—

The specimen is the real Nut Grass (*Cyperus rotundus*), which is such a pest in cultivation in Queensland. Fowls and ducks, particularly the latter, generally manage to keep the plant in check and eventually eradicate it, as they pick off the green shoots as soon as they appear above ground and, consequently, the tubers eventually shrivel.

Indigo.

H.V.P. (Kolan River)—

The specimen is a species of Indigo (*Indigofera suffruticosa*), supposed to be a native of tropical America but now widely spread over the tropical and subtropical regions of the world. It is a legume and although there is no available information as to its being eaten to any extent by stock, it should be quite a valuable fodder. Other species of Indigo in our pastures are eaten and generally regarded as nutritious. The plant is very common in North Queensland but in the southern parts of the State, mostly inland, a few patches here and there are seen, but not in any great abundance. It has been established as a minor weed about Bundaberg for many years. It is possible that stock keep it in check. The plant should be a valuable green manure. It is not known to be poisonous or harmful in any way.

Pigweed.

F.E.C. (Townsville)—

The common Pigweed of Queensland is *Portulaca oleracea* and is frequently used as a green vegetable. The other plants known as Pigweed are species of *Trianthema*. These are not used for food but are not known to be harmful in any way.

Wild Senna.

B. (Morganville)—

The specimen is Wild Senna, also known as Yellow Pea or Arsenic Bush along with other species of *Cassia*. Feeding tests have shown this weed to have a somewhat purgative effect, but otherwise harmless. The plant is a common tropical weed and in the West Indies the seeds are said to be used, ground up, as an adulterant of coffee.

PLANT PROTECTION

Deficiency Diseases of Citrus.

W. A. T. SUMMERVILLE, Senior Research Officer, and F. W. BLACKFORD, Assistant Research Officer.

IN addition to the diseases which are caused by the activities of parasitic organisms, citrus trees may be affected by a number of physiological disorders. In Queensland, the more important of these are connected with inadequate supplies of certain essential plant food materials. Disorders of this nature resemble plant parasitic diseases in a general way and are commonly known as deficiency diseases. Usually, however, they result in the production, by the tree, of abnormal tissue rather than in the death of parts, though death may follow through the inability of the plant to function normally. In these diseases, the abnormality is most commonly encountered in the size, structure, and colour of affected parts.

The total absence, insufficiency, or unavailability of any one of the many elements required for the normal growth of the citrus tree could lead to a deficiency disease, but, in this State, such a trouble is usually attributable to a lack of one or other of eight elements, and of these the only ones which have so far been associated with serious losses are zinc, copper, nitrogen, and iron. In the case of most elements, it is usual to refer to the disease as a deficiency of the element concerned as, for example, nitrogen deficiency or iron deficiency. In certain cases, however, the disease was of importance for a considerable period before its cause was discovered, and in these cases names were given which were descriptive of the symptoms. Thus zinc deficiency was known as mottle leaf and copper deficiency was called exanthema. It seems desirable that these terms be retained and, accordingly, zinc and copper deficiencies in citrus are discussed in this article under their old names. As they are of particular importance, these two diseases will be considered at some length. Nitrogen deficiency will be discussed in sufficient detail to ensure that the type of symptom associated with such malnutrition will be made clear. Briefer, but adequate, reference will be made to iron deficiency.

MOTTLE LEAF.

Several causes lead to mottling of the leaves of citrus trees, but, in Queensland, the term "mottle leaf" is usually applied to the particular type of mottling which is brought about by the trees not receiving adequate supplies of zinc. In this type, the green colour is absent from irregularly-shaped patches between the veins, whilst the veins themselves remain green and often appear rather deeper in tone, against the creamy-yellow patches, than the veins of normal leaves (Plate 170). In addition to showing the mottled effect thus created, the leaves of affected trees are often markedly reduced in size and rather more elongated and pointed than normal leaves. Furthermore, these mottled leaves develop a harsh appearance and become distinctly brittle.

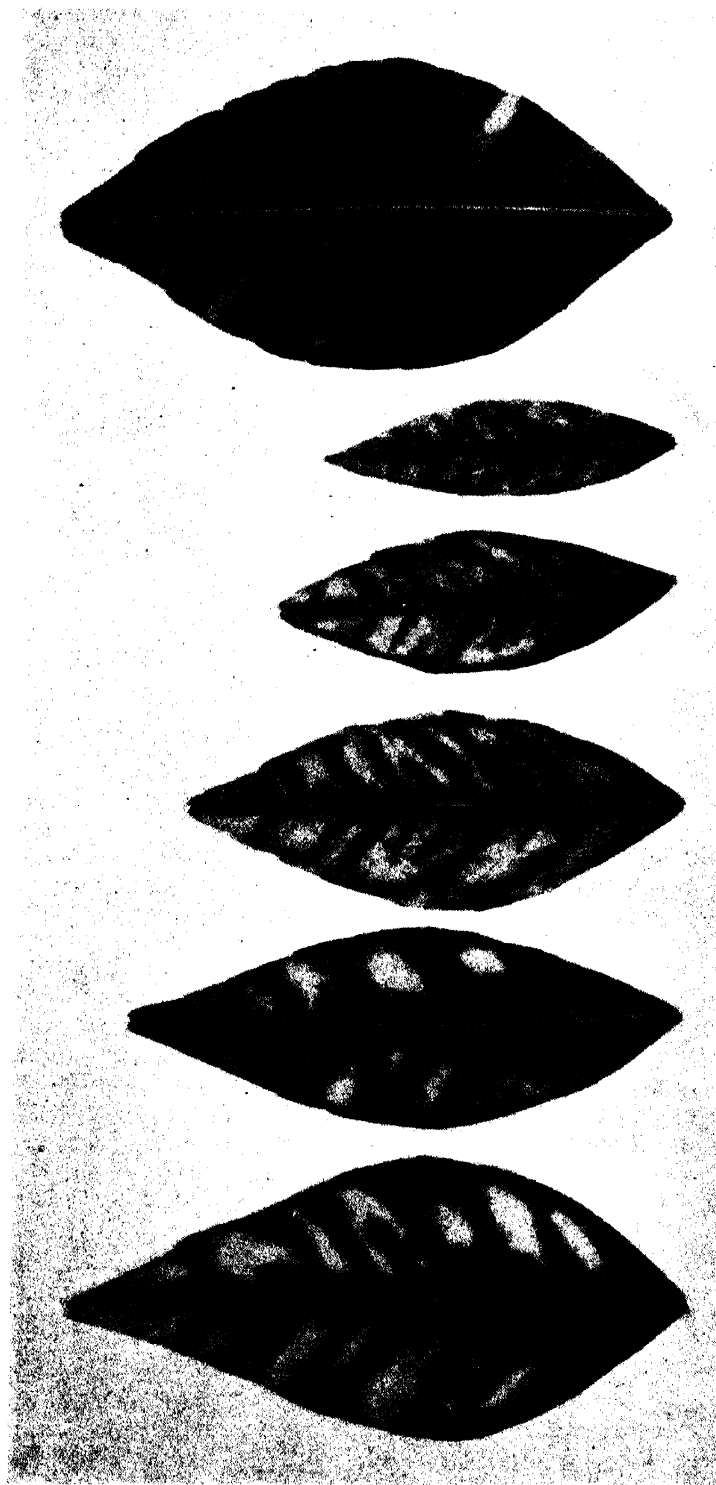


Plate 170.
MOTTLE LEAF OF CITRUS.
Normal leaf on extreme right.

Reduction in size and the development of brittleness, however, may also characterise some normally-coloured leaves on affected trees, whilst, inside, succulent growth is often healthy and vigorous, even when the more-exposed foliage is almost wholly mottled. Affected trees produce small, unmarketable fruit which generally colours prematurely and remains hard and woody. Trees affected by mottle leaf are seldom killed, but usually become worthless.

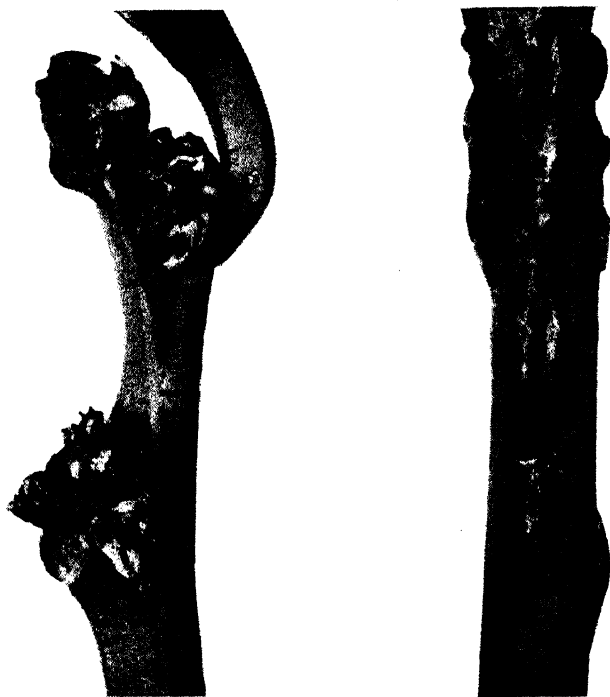


Plate 171.

EXANTHEMA ON ORANGE.—*Left*: Malformed and multiple buds. *Right*: Bark splitting. Figures slightly enlarged.

Growers sometimes prune affected trees heavily, and this procedure is often followed by the production of leaves which are normal in colour though, perhaps, smaller than on healthy trees. These leaves, however, may become mottled after a short period, and the trees receive a further pruning. Such successive, heavy prunings produce a harsh, stunted appearance in the tree. Nothing of value is accomplished by this pruning treatment.

No plant parasitic organism has been found associated with mottle leaf, and the precise cause of this disease is not known although, essentially, it must be regarded as being due to a deficiency of zinc. Such a deficiency could be caused either by lack of zinc in the soil or the inability of the tree to absorb the amount of zinc necessary for its normal growth. It is not surprising, therefore, that mottle leaf is associated with certain types of soil, and in general in this State this trouble is in evidence mainly on sandy soils. Young trees from a nursery on such soils may show mottle leaf symptoms to a slight extent when they are planted on the heavier types of soil, such as the basaltic loams, but the trouble does not persist for many months, and no remedial measures are called for in such cases.

Control.

This deficiency disease can be controlled by applying zinc to the leaves of the trees in the form of a spray, the formula being 4 lb. of zinc sulphate and 2 lb. of hydrated lime in 40 gallons of water. The zinc sulphate is dissolved in one half of the water in the spray vat, and the hydrated lime, mixed with a little water, is slowly poured in while the vat is being filled with the balance of the water; the contents of the vat should be stirred briskly during the whole mixing process. For slightly-affected trees, the strength of the spray may be reduced to half the above quantities of zinc sulphate and hydrated lime. The usual time of application is at the flush of young growth in the spring so that the zinc spray may be combined with the routine application of cuprous oxide mixture for disease control at the $\frac{1}{2}$ to $\frac{3}{4}$ petal-fall stage. In districts where fumigation is used for insect-pest control, a zinc sulphate spray in which caustic soda is substituted for hydrated lime at the rate of 4½ oz. of caustic soda for each pound of zinc sulphate is recommended for combination with the copper mixture to avoid possible injury by fumigation.

EXANTHEMA.

Trees affected by exanthema (Plate 171) commonly produce abnormally large, dark-green leaves, which often convey, to a casual observer, an impression of particularly good health. Closer examination, however, reveals the fact that such trees carry an unusually high proportion of dead twigs; in the worst affected cases, of course, it is obvious that die back of the twigs is the dominant characteristic of wood more than a few months old. A careful examination of affected trees shows that the twig growth is so bunched that, instead of two or three twigs arising close together, six or more such shoots have originated near each other and, as a consequence, each is spindly and angular. This angularity persists, and there is an absence of the evenly-rounded twig growth which characterises a healthy citrus tree. Furthermore, small, raised, blister-like patches which split lengthwise may be found on the surface of some of the young twigs. A resinous, brown gum is pushed out along the edges of these cracks and produces an appearance somewhat similar to proud flesh in animal wounds. An additional symptom which is not always found, but which, when present, is very conspicuous, is a cluster of many closely-packed, malformed buds in the leaf axils instead of the two that are normally present.

As is the case with mottle leaf, no organism has been found to which exanthema can be attributed, and it seems that the primary cause of this trouble is a lack of copper in the tree. As with other elements this deficiency may be brought about by there being an insufficient quantity of the element in the soil or by the inability of the plant to absorb the material, even though an ample supply is present. For the most part the latter explanation seems to be the one that is generally applicable in Queensland. At all events, soil conditions which tend to inhibit the uptake of plant foods are commonly associated with the occurrence of exanthema in this State. Thus faulty drainage and a hard pan close to the surface of the soil are very frequently found to be factors contributing to the incidence of the trouble.

Control.

If permanent results are to be obtained in the control of exanthema it is essential that any contributory adverse soil condition be remedied. In the first place, the physical condition of the soil should be examined

and, if necessary, improved by whatever appropriate action is practicable. Following this, fertilizer applications should be made, bearing in mind the fact that, whilst fairly liberal applications should be given, it is not advisable to be over-generous with nitrogen; the best practice is to provide the nitrogen in a number of light dressings at long intervals. Then, to rehabilitate an exanthema-affected tree, the bunched twigs must be thinned out and the dead wood removed; the gum-filled cracks on the twigs are sloughed off later as the tree makes healthy growth and thus require no further attention.

It has been found that exanthema may be quickly cured by treating an affected tree with copper. This may be accomplished by spraying the tree with cuprous oxide mixture, using the spray at a strength of 3 gallons of stock solution to 40 gallons of water. The routine citrus disease control sprays are sufficient for this purpose, or, if these are not ordinarily applied, then an application could be made in the spring when the fruit has been set, and repeated later if necessary. An alternative method, which is not considered to be quite so satisfactory, is to treat the soil by sprinkling fine bluestone crystals, i.e., copper sulphate, on the ground under the tree at the rate of 1 to 4 lb. per tree, the actual rate depending on the size of the tree, and then chipping it in. The recommended rate of application of copper sulphate should not be exceeded, otherwise the root system may be injured. Results from these treatments should not be expected until at least twelve months after their application.

NITROGEN AND IRON DEFICIENCIES.

Trees suffering from a deficiency of nitrogen present a general unthrifty appearance and make comparatively little growth in response to favourable climatic conditions. The foliage on such trees is sparse, and individual leaves are often reduced in size, but the most conspicuous symptom is the yellow leaf colour. There is no leaf mottling such as occurs in several other deficiency diseases. Certainly, the veins may be somewhat lighter in colour than the rest of the leaf, but this is not usually noticeable. When the trouble is due to lack of iron, the leaves are pale yellow and the veins remain green for a considerable time. This point enables the citrus grower to differentiate between nitrogen and iron deficiencies which, at times, are superficially alike in the very early stages. Even in extreme cases, trees lacking nitrogen may flower profusely and set a heavy crop of fruit. However, the fruit does not grow to normal size and usually only a very small proportion is marketable. The fruit tends to ripen early and may colour prematurely.

As far as nitrogen deficiency is concerned, a general remedial measure is the application of a liberal ration of some nitrogenous fertilizer. Acute nitrogen deficiency, however, rarely occurs from a simple cause except in cases of neglect, and it is accordingly essential to ensure that, in addition to the nitrogen supply, soil conditions are otherwise suitable for the growing of citrus. No comprehensive recommendation can thus be made as to rates of application or form of fertilizer required to check nitrogen deficiency. Such recommendations will vary from case to case and can be determined only after an examination of the conditions under which the deficiency occurs.

Iron deficiency in Queensland is usually remedied quickly by applying up to 4 lb. of sulphate of iron to the soil under each affected tree. This procedure is not effective on certain types of soil, but no such soil type has yet been encountered in citrus orchards in this State.



Dairy Premises.

E. B. RICE, Director of Dairying.

THE fundamental factors involved in the planning, constructing, and equipping of dairy premises are —

1. Selection of site with due regard to aspect, drainage, and surroundings.
2. Provision of an adequate water supply for both dairy requirements and stock.
3. Giving due regard to—
 - (a) Good sanitation and hygiene
 - (b) Good ventilation and lighting
 - (c) Protection of quality of produce.
 - (d) Convenience of operation and economy of labour.
 - (e) Durability, service, cost.

It is generally appreciated that reasonable facilities, such as a weather-proof milking shed, wash-up and separating rooms and the essential equipment for the tasks incidental to milk and cream production, assist to relieve some of the tedium connected with the twice-daily milking-shed routine on a dairy farm. The design of modern dairy buildings and equipment is conducive to efficiency, sanitation, convenience and simplification of cleansing, and other procedure. However, it must always be remembered that the personal equation—that is, the will of the individual to do a job well—can outweigh every other factor and that good equipment can only facilitate the production of high quality dairy produce. Although quality is chiefly governed by the appreciation and application of the well-known principles of dairy hygiene, certain minimum structural and other requirements must be insisted upon for premises engaged in producing such perishable human foodstuffs as dairy produce. The standard buildings and other dairy facilities specified in the Dairy Produce Act, which cannot be regarded as unduly expensive or elaborate, essentially fulfil the structural and sanitary requirements.

Structural and Other Requirements.

The principal considerations in the erection of premises to ensure their compliance with the principles enunciated above are:—(a)

Suitability of site, (b) water supply, (c) drains and drainage, (d) floors, (e) wells and roof, (f) light and ventilation.

(a) *Site*.—The site of the main dairy buildings is of primary importance. If possible a well-drained position, not too far removed from the road and the farm residence, and on firm ground (preferably gravel) should be chosen. If available, a north or north-easterly sloping aspect is ideal, for it enables the shed to be built with its open end facing north or north-east, thus giving exposure of the floors to the germicidal rays of the sun for the maximum time each day. If the erection of the combined dairy building is contemplated, the separator room and verandah should, if possible, face east and the side wall of the separator room south. The site must have a slope away from the building to give effective drainage. The site for the piggery, if there is to be one, should be borne in mind when selecting the site for the dairy premises. The piggery should not be situated on a higher site than the milking yard otherwise contamination from drainage and storm rains must result. In addition, having the piggery down hill from the dairy buildings saves much effort. Wooden rails with trolley may then be used to convey separated milk to the pigs, or the skim-milk may be pumped from the separator room to the piggery by means of a milk pump and piping.*

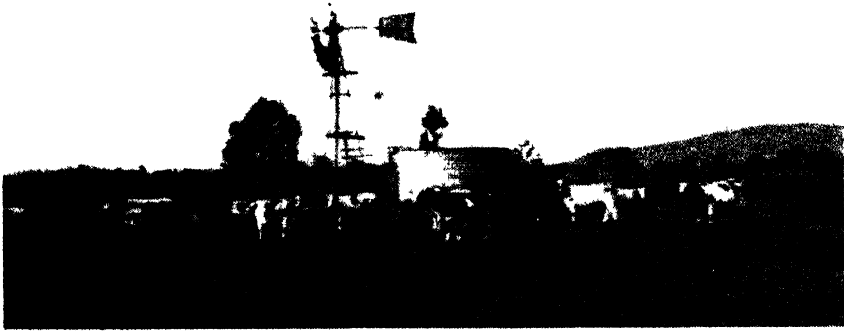


Plate 172.

THE NECESSITY FOR AN ABUNDANT WATER SUPPLY IS RECOGNISED ON THIS FARM.

(b) *Water Supply*.—The availability of an abundant supply of water on every dairy farm, and especially in proximity to the dairy sheds, is of utmost importance. Unfortunately, water is not always easily available on Queensland farms, while in other cases the necessity for it to be laid on to the dairy is not always fully appreciated. The ideal is to have water available in all paddocks so that, to ensure maximum production, stock have access to it whenever they require it. How

* Where milking sheds have to be built on level ground, it is desirable to elevate the site before commencing to build. A few days spent with plough and scoop, or grader, raising the site for the shed and yards approximately 2 feet above the surrounding country is time well spent. The work should be done well before building operations commence to enable the foundations for the cement floor to become consolidated. If stock are allowed to trample the raised site this will shorten the period required.

often is water lacking in a night paddock? Thus the water supply is often a limiting factor in the quantity and quality of the milk or cream produced. Ample water is necessary for cooling purposes, washing and sterilising utensils and washing down of floors. It should be readily apparent that if creeks, wells or bores are not situated on the farm, it is impossible to conserve sufficient water in tanks from roof drainage to efficiently perform all the operations for which water is essential. Where ample water is available, its storage in elevated tanks adjacent to the dairy premises is most desirable. Such a supply gives the pressure so helpful in the washing down of floors, cooling, &c.

(c) *Drains and Drainage.*—Provision must be made for proper drainage if a serious menace to health and quality is to be avoided. A common failure is not extending the drainage system at least 30 feet away from the building—as specified in the Regulations. The drain, which should be without a sharp edge, should be wide enough to enable thorough sweeping out, and for dairy purposes need only be shallow. It should fall away from the dairy section of the building in order to discharge all drainage in the opposite direction outside the cow yard and be carried at least 30 feet away from the bails. Any drain which is likely to have traffic passing over it must be strong enough and so laid that it does not become damaged. Precautions should be taken to ensure that drainage does not run off to contaminate the water supply, a nearby watercourse, or the cow yard.

(d) *Floors.*—The Regulations specify the use of a non-absorbent material for all floors in dairy buildings. Other considerations in the selection of a flooring material are durability, sanitation, expense, and ease of cleaning. Concrete, which cannot be surpassed for Queensland conditions, is almost universally used. All floors must be graded to enable effective cleaning, the draining away of all moisture, and rapid drying off. Unless suitably reinforced, concrete floors will tend to “creep” on black soil, such as the Downs. Successful results have also been attained by placing a 3 inches layer of antbed under the concrete.*

Acknowledgment is made to the “G. & N. Co-operator” for the following hints on the preparation of concrete floors in dairy buildings:—

“The mixture recommended for concreting the floors of cow bails and yards is 4 cubic feet of screenings or gravel, graded from $\frac{1}{4}$ inch up to $1\frac{1}{2}$ inches and $2\frac{1}{2}$ cubic feet of clean sand, graded from fine to $\frac{1}{4}$ inch, to each paperbag of cement (1 cubic foot), with only sufficient water to make a workable mix. This concrete, 3 to 4 inches in thickness, can be worked to a good non-slip finish without the necessity for a separate layer of sand cement mortar on the top.

“Level off the ground without disturbing unduly, but if the ground consists of clay, it is advisable to place a layer about 2 inches thick of sand or ashes before laying the concrete.

“After placing the concrete, screen off the surface with a straight-edge or long piece of timber, and leave the job for about two hours, then return to give the finishing touches with a wood float. Do just

* A common fault in the construction of concrete floors of milking sheds is to have the floor lower than the yard. If it be necessary to excavate the soil with a view to obtaining a firm foundation, it should be replaced with gravel or metal in order to ensure that the completed floor will be 8 to 12 inches above the surrounding area. This avoids flooding in wet weather.

sufficient work with this tool to obtain a moderately roughened sand-stone texture, which will be smooth enough to sweep clean, and yet will not be slippery.

"To make a cubic yard of concrete of above mixture the following quantities of materials will be required:—6 bags of cement, 15 cubic feet of clean sand, 24 cubic feet of screenings or gravel (27 cubic feet, 1 cubic yard).

"A patch of this size to be put down 4 inches in thickness will cover an area of 9 square yards. It is advisable not to attempt slabs of more than 10 feet by 10 feet without joints. The slabs can be butted hard against each other.

"To make sure that the cow yards keep dry, it is advisable to have a slope from the centre to the sides (or, if desired, have the yard sloping all the one way), with a fall of not less than $\frac{1}{4}$ inch in 6 feet. By this method the drain need be placed around the outer edge only. To make the drain continuous with the concrete place a sloping piece of timber carefully in position to make out the direction and shape of the drain before pouring the concrete, and it will be found possible to shovel the concrete underneath the timber.

"Another very simple method is to spread the concrete and then squeeze down into it lengths of 4 inch pipes, which could be left in the concrete for about two hours, and then carefully removed.

"As regards the bails, not more than two bails should be placed as a continuous concrete slab; larger areas than this are likely to crack. The position of the drain is optional, but the best position seems to be inside the entrance to the bail near the cows' hoofs about 8 inches or 10 inches from the posts.

"Within 24 hours of placing, cover all concrete with wet bags earth, sand, or waterproof paper, and keep wet for at least seven days. This is called curing, and is of the greatest importance in obtaining maximum strength."

(e) *Walls and Roofs*.—Dwarf concrete walls at least 18 inches, and preferably 3 feet, high at both ends of the bails and not less than 6 inches high elsewhere should be provided in all dairy structures to protect the wooden walls from constant dampness and eventual decay. Depending on the use to which a building is put the walls may be of concrete, brick, wood, fibro-cement, or galvanised iron. Interior walls of the dairy and separator room must be smooth and, from the sanitary standpoint, vertical boarding with tongued and grooved timber for the lining of dairy buildings is preferable. Fibro-cement is also very satisfactory for lining.*

(f) *Ventilation and Light*.—Sufficient light is usually available in buildings in this State. Indeed, precautions sometimes have to be taken to protect dairy produce from deterioration through exposure to direct

* Galvanised flat iron makes inexpensive and hygienic interior walls for the separator-room and aerator-room—the studs require to be placed to suit the size of iron sheets used and kept on the outside of the room. The minimum height for walls of the milking shed is 7 feet, and for the detached dairy house 8 feet.

Corrugated galvanised iron or corrugated fibro-cement are usually used for roofing. Because of its coolness, the latter is preferable for the main dairy buildings. Similarly, a hip roof provides cooler conditions than a flat roof; the ceiling should follow the contour of the roof.

sunlight. Windows in the dairy house must be so placed or shielded as to keep the sun's rays from shining on milk or cream. The separating room, wash-up room, and milk or cream storage room must be well ventilated to provide coolness. The regulations specify the requisite means for ensuring ventilation in the different buildings.

The separator room must be made flyproof. Although the dairy house (A) is not fly proof, it is found to be virtually fly free; in any case, cream stored therein is protected from flies by fitting to each can a flyproof, brass-woven wire of No. 12 mesh and No. 24 gauge, or other approved material, attached to a metal rim.



Plate 173.

A CLEAN, WELL-MADE YARD MEANS CLEAN COWS AND MANURE CAN EASILY BE COLLECTED FROM IT FOR DISTRIBUTION ON THE LAND.

Assembly or Cowyard.

A strong and roomy yard for assembling the cows before milking is indispensable. It is usually constructed of posts and rails, at least 4 ft. 3 in. to 4 ft. 6 in. high, the rails being of 5 inches by 3 inches hardwood or bush or other timber of equivalent strength. The yard must be large enough to hold all the cows in the herd. It should be on a well-drained piece of land with the slope away from the milking shed and dairy and preferably having a northerly or north-easterly aspect. Gravelling is advisable, but in some soils may not be entirely successful. In such cases, or in wet coastal areas, a smaller holding yard, into which a few cattle may be drafted at a time from the larger yard, is recommended. The concreting of this small yard ensures much greater comfort in wet weather and reduces dust in the shed. This concrete should not be finished to a very smooth surface. In heavy rainfall districts the building of a roof over this small concreted yard is suggested; the roof must be high.

The placing of the holding yard on the end, instead of in front, of the bails is being increasingly adopted with a view to the abatement of the dust in the shed and dairy. A further advantage of a side assembly yard is that it enables the shed to be adapted for carrying out all dairy operations, including milk or cream storage, under a single roof. In this type of layout the provision of a strip of concrete about 6 feet wide in front of the bails will facilitate the handling of the herd during milking.

It is important that the cowyard fence nearest the dairy end of the shed be projected from the first bail, thus excluding the dairy end of the shed from the cowyard

Milking Shed, Dairy Houses, &c.

Milking Sheds.—For Queensland climatic conditions, elaborate buildings are unnecessary as dairy cows are never housed indoors. The milking shed is only to afford the milkers protection from the weather. Nevertheless, conditions can be most unpleasant in hot, cold, or rainy weather if the shed has the wrong aspect or is ill-designed. As previously stated, the open end of the shed should, if possible, face north or north-east. Materials usually used are weatherboard for walls and galvanised iron or corrugated fibrolite for the roof. The height of walls must be at least 7 feet.



Plate 174.

SOUNDLY CONSTRUCTED "WALK-THROUGH" BAILS.—Note the dummy bails suspended from roof.

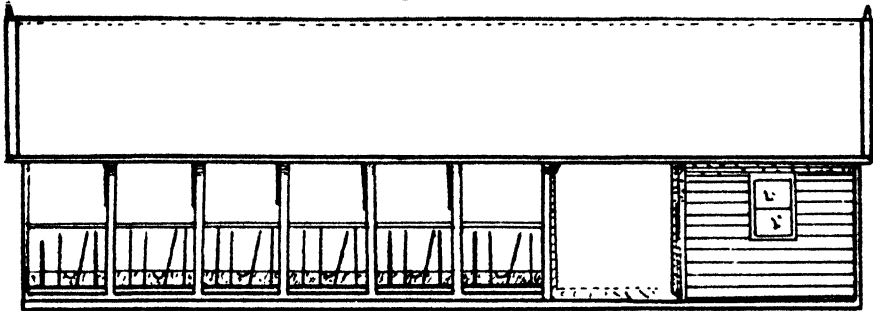
Milking bails commonly found in this State may be classified as—

1. New Zealand walk-through bails (double bail type);
2. New Zealand walk-through bails (single bail type);
3. Return bail type;
4. "Sword" bails;
5. Crush bails.

Bails of the "walk-through" type (Plate 174) are in most popular demand and in recent years have almost entirely displaced

all other designs, except for town dairies engaging in hand-feeding of stock. Their popularity is due to the fact that hand-feeding is practically unknown on most Queensland farms supplying butter and cheese factories. If hand-feeding is resorted to in drought periods it is usually carried out in temporary feeding stalls. The suspended type of dummy bails (well strengthened) facilitates cleaning.

The advantages of the "walk-through" system are—(a) by the milked cows going straight out to the grazing paddocks the grazing periods are lengthened; (b) the milked and unmilked cows do not become mixed in the assembly yard and so congestion is avoided and time saved; and (c) the backing out of the shed of the milked cows, with danger of accident from slipping, is eliminated.



ELEVATION (FROM REAR OF BAILS.)

Plate 175.

"RETURN" TYPE BAIL.

When milk for human consumption is produced on farms adjacent to towns, hand-feeding is often a regular practice and the "return" bail shed (Plate 175), in which hand-feeding is facilitated, is commonly preferred. However, walk-through bails are now being more extensively used on these farms, the feeding being carried out in a separate shed.

Attempts to provide more comfortable conditions in milking sheds are now receiving more attention. Many sheds are unbearably hot in the summer. The milking shed is very rarely ceiled, although favourable reports on their coolness of the few ceiled sheds known to dairy officers have been received. Large openings fitted with shutters at each end of the bails provide coolness. A door, opening inwards, between each dummy bail, which may be left open on hot days, tends to reduce the heat. Such a door is more suitable than fixed louvres as, unlike the louvres, it can be shut in cold weather.

Dairy Houses.

Dairy House "A" (Plate 176).

A detached dairy house at least 30 feet away from the cowyard, in which to store cream, is required for cream-supplying farms, unless the combined building, referred to later, is provided. Its minimum dimensions are 8 feet long by 6 feet wide by 6 feet high. The ceiling should preferably follow the contour of the roof. In conjunction with this dairy house a place for the cleansing of utensils is to be provided. This may be a veranda 8 feet long by 5 feet wide by 6 feet 6 inches high or a Dairy House "B." It is recommended that a veranda be

attached to Dairy House "A" and that it be made somewhat wider than the minimum of 5 feet prescribed by the Regulations—say, 6 feet 6 inches. The veranda may, if desired, be extended to cover two or more sides of the dairy. The dairy must have a dwarf concrete wall of at least 6 inches high by 3 inches thick, to which a hardwood plate may be affixed as a base for the walls. Besides sloping the floor and providing a 30-foot drain, other requirements of the Regulations are—

- (a) The provision of ventilation by means of 16-inch-wide openings at the top of all walls, protected by a 19-gauge woven wire or wire netting of $\frac{1}{4}$ -inch or $\frac{1}{2}$ -inch mesh;
- (b) The provision of two openings, not less than 9 inches wide and extending at least two-thirds of their length in two opposite bottom walls (not the veranda wall), galvanised iron woven wire, No. 18 gauge and $\frac{1}{4}$ -inch mesh, protects these openings, which must also be shaded in an approved manner;
- (c) The dairy must be lined and ceiled



Plate 176.

REGULATION DAIRY HOUSE "A" WITH VERANDA FOR WASHING AND STORAGE OF UTENSILS.

The veranda or Dairy House "B," as the case may be, accommodates—

- 1. The separator (on hand-milking dairies);
- 2. A wash-up trough not less than 34 inches long by 20 inches wide by 11 inches deep, fitted with a draining plug;
- 3. A draining rack not less than 16 inches wide of galvanised iron piping or other approved material for the drying of utensils, &c.

In the case of a dairy operating a milking machine, separation may be done in a room adjacent to the milking shed, providing—

- (a) The room is ceiled;
- (b) All openings, including windows, are

protected by 16-mesh, flyproof, rustless wire gauge; (c) The doors are self-closing; (d) The floor is impervious to water, sloped, and drained; (e) The walls are smooth and the roof waterproof; (f) A walled air space of at least 6 feet is left between this room and the nearest bail. This space may be, and usually is, used to house the engine and vacuum pump of the milking machine. The engine may be protected from inclement weather by fixing louvres in the far end of the air space, the overhang of the shed roofing giving sufficient protection to the end facing the cowyard. The separator-room should be at least 10 feet square, thus enabling the milk vat to be placed approximately 2 feet from the wall. The lining of the wall near the milk vat with flat sheet iron, painted white, is suggested as a means for controlling mould growth on the portions of the walls adjacent to the milk vat. This reduces the unsightly mould growth so common in a small separating-room.

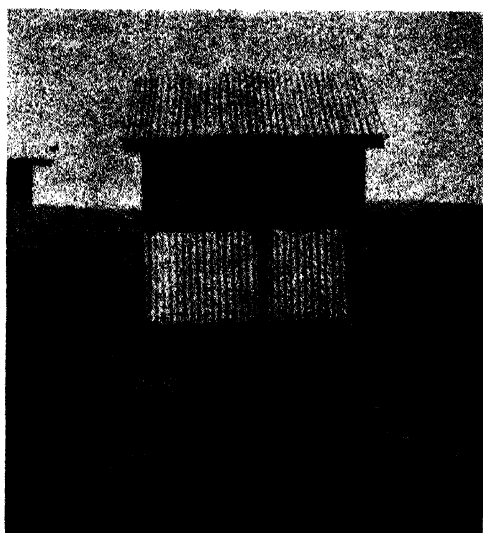


Plate 177.

DAIRY HOUSE "B" ON A FARM SUPPLYING MILK TO A CHEESE FACTORY.

Dairy House "B."

On farms supplying milk to a cheese factory, or for local consumption, Dairy House "B" (Plates 177, 178) may be used in lieu of the Dairy House "A." Its minimum dimensions are 6 feet long by 6 feet wide by 7 feet high, but it is recommended that it be made at least 8 feet long. The wash-up trough and draining rack already described are placed in Dairy House "B." The cooling and aeration of milk is also carried out in this room.

Covered Milk Stand.

Milk kept on the farm overnight for supply to cheese factories must be placed in a covered milk stand not less than 4 feet wide by 4 feet long by 4 feet high, and the floor of which is 3 feet from the ground. The roof must have an overhang to protect the milk from the weather and the eastern side of the stand must be louvred to protect the cans from the sun's rays in the morning. A trolley on

rails connecting the milking shed and the milk stand minimises the work involved in removing the filled milk cans to the milk stand.



Plate 178.

DAIRY HOUSE "B" CONSTRUCTED TO SERVE ALSO FOR HOLDING MILK OVERNIGHT.—
Note attached galley to house steam steriliser.

On a milk-supplying farm using milking machines, a room adjacent to the milking shed may be used for cooling and aerating the milk, but it must be kept in the covered milk stand overnight.

Roadside Cream Shelter.—For the protection of cream placed at the farm entrance in readiness to be picked up by the cream lorry a roadside cream shelter should be provided. It need not be expensive; indeed, sufficient material for its construction is usually available on a farm. The floor of the shelter should be not less than 3 feet 6 inches, and not over 3 feet 9 inches, from the ground and the floor area must be sufficient to hold the maximum number of cans of cream produced. Unless louvred, the shelter will be too hot in summer and cream stored therein liable to suffer deterioration.

Suggested Layout for Small Hand-milking Farm.

For small farms on which hand-milking is employed a serviceable layout of dairy buildings would be—(a) Milking shed of desired type; (b) Detached Dairy House "A" with veranda for separating and washing up in the case of cream suppliers, or Dairy House "B" and covered milk stand in the case of cheese factory suppliers. This layout (Plate 10) is the most inexpensive. It entails the erection of a milking shed to be used for milking only, without any other room attached thereto and the performance of all other operations in the dairy situated 30 feet away. The layout, by necessitating the removal of the milk from the vicinity of the cow shed as soon as it is produced, and keeping it, or the cream separated therefrom, and all utensils away from the bails and cowyard, minimises contamination from dust and absorption of cowyard odours. It is advisable to have the veranda on the western side of the Dairy "A" to protect the cream from the sun's rays in the afternoon.

[TO BE CONTINUED.]

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of Australian Illawarra Shorthorn and Jersey Societies. Production records for which have been compiled during the month of April, 1944 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
Lb.				
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (STANDARD 350 LB.).				
Cedar Grove Madam 5th	W. H. Sanderson, Mulcumbie	18,598.52	680.716	Cedar Grove Empire
Model 2nd of Alfa Vale	W. H. Thompson, Nanango	13,503.15	663.182	Reward of Fairfield
Jamberoo Reddy 5th (365 days)	M. J. Brosnan, Clifton	18,383.4	656.976	Brooklyn Terrace Banker
Queenie 19th of Greyleigh	W. H. Thompson, Nanango	13,831.95	519.282	Thornleigh Champagne
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Jamberoo Modesty 11th (365 days)	M. J. Brosnan, Clifton	17,158.3	638.557	Greyleigh Valiant
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Bingleigh Ethel	J. C. Meier, Grandchester	8,954.75	340.447	Blacklands Count
Happy Hill Lella	R. R. Radel, Coalstoun Lakes	9,929.99	281.378	Sunnyview Artist
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Jamberoo Winnie 4th (365 days)	M. J. Brosnan, Clifton	13,682.1	529.245	Greyleigh Valiant
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Bingleigh Ruby	J. C. Meier, Grandchester	10,757.11	434.308	Blacklands Emblem
Jamberoo Marjorie 8th (365 days)	M. J. Brosnan, Clifton	10,250.9	387.357	Greyleigh Valiant
Silver Glen Princess	V. R. Nugent, Murron	10,726.15	371.431	Aynsley Renell
Jamberoo Gracie 2nd	M. J. Brosnan, Clifton	8,323.15	331.192	Greyleigh Valiant
Bingleigh Miss Jean 2nd	J. C. Meier, Grandchester	8,028.17	310.145	Blacklands Emblem
Edendell Jeanette	A. Manderson, Gleagle	6,173.65	289.262	Dhalwon Penrose
JERSEY.				
MATURE COW (STANDARD 350 LB.).				
Treacarne Safety 2nd	P. H. Schull, Oaky	7,584.75	407.667	Trinky Some Officer
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Boree Pearlle	W. and C. E. Tudor, Branch Creek	7,842.06	400.979	Boree Soldier Boy
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Boree Beauty	W. and C. E. Tudor, Branch Creek	8,292.22	380.571	Boree Soldier Boy
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Bellgarth Fashion 2nd	D. R. Hutton, Cunningham	7,761.94	386.003	Treacarne Renown 2nd
JUNIOR, 2 YEARS (STANDARD 250 LB.).				
Bellgarth Goldie	D. R. Hutton, Cunningham	5,062.85	252.742	Treacarne Victor 2nd

POULTRY

Egg Production.

P. RUMBALL.

THE egg production objective for the controlled area of Queensland for the year ending June, 1944, has been fixed at 8,000,000 dozen. It is estimated that production will fall short of this objective by about 500,000 dozen. The lag in production may be ascribed to several causes, none of which was probably avoidable, particularly by the individual producer. The objective for the 1944-45 year has been fixed at 8,500,000 dozen eggs, which many producers say cannot be attained. It can if everyone engaged in egg production gives of his best.

A good start has been made. Many thousands more chickens have been hatched during the first six months of this year than in any previous year. The excess of hatching during this period over previous figures may approach 250,000 chickens. Many chickens have already been despatched to places beyond the area of control, but a big proportion of the season's hatches has been retained within the area. Reports of hatching for the second half of the year indicate that a record hatching will again be made. Many of these chickens will come into production before June, 1945, and so assist in attaining the objective for that year.

The right start has been made and it now remains for producers to bring about the increased production aimed at. It may be thought by many that the reaching of the goal is of no immediate concern to them. This is not so. Every person engaged in poultry raising should seriously concern himself with the supply of eggs. The acute shortage of eggs will, no doubt, cause a large number of people to commence the keeping of poultry for home requirements; others, again, may refrain from using eggs, so when the position returns to normal poultry raisers may be scratching for markets. This may be considered a very good reason why the industry should not be expanded. The production objective set, however, is not much beyond the pre-war aggregate, most of which was sold on local markets. If householders are forced to produce their own eggs, and others become more or less habituated to doing without eggs, when conditions return to normal the local market may be adversely affected to a serious extent. Producers may not commonly be aware of the fact that for years past sales of eggs on the local market have increased year by year. This has not merely been because of any increase in population, but to the fact that an assured egg supply has removed the necessity of householders producing for their own domestic requirements.

Again, for years after the last war, no difficulty was experienced in handling any surplus. Overseas markets were available; in fact, export outlets gave marketing organisations the means of stabilising their operations, thus enabling the industry to be built up to the existing standard. There is every prospect of overseas markets absorbing any surplus for years after the present war.

In an effort to increase production by increasing the size of the flocks, farmers have had to face many difficulties chiefly because of the shortage of wire netting, building material, and equipment. The netting position has somewhat improved, and poultry raisers are now able also to obtain fibro cement, both corrugated and plain. The equipment position is still difficult, but the increase in the number of poultry houses erected in the course of the past year should permit of the housing of sufficient birds to make a material contribution to production, if every individual producer does his part.

In past years, poultry raisers have been advised to refrain from early hatching, as the chickens come into production during that period of the year when the egg supply is plentiful and values are low. There is, however, every reason to believe that values during the coming spring will at least be as high as during last spring. If this happens, the retention of the early hatched pullets for egg production should be highly profitable; and although many have been raised to meet the demand for table purposes, the keeping of these birds for egg production at least until they commence to moult will go far in assisting in the attainment of the production objective. In previous years, it has been the custom for many to commence disposing of large numbers of second-year hens early in spring. When egg values were low this was a sound practice. The withholding from the market of this class until the birds commence to moult should also materially assist in achieving the goal set, and only delay the quantity of table poultry to be marketed. This policy may also prove a very profitable venture, as hatching commenced much earlier this year than in previous years. More cockerels are now being reared than is usually the practice, and the delay in marketing unwanted hens will prevent the possibility of the table poultry market becoming over supplied.

To enable the maximum production to be obtained, good husbandry practices are essential. As many of the chickens hatched will go to mixed farms, and as much of the Queensland production comes from this source, the following points in poultry husbandry are stressed.

Stock.

As a rule, farmers engaged in general agriculture give little attention to breeding poultry. Farm duties are too numerous to attend to the detail necessary for the work. The broody hen is usually the hatching medium for the replacement of the farm flock. The invariable result is a hatch of indifferent quality. Therefore, the best plan for the general farmer to adopt is to buy day-old chickens from some reliable hatchery.

Kind of Chickens.

Either pullet day-old chickens, or day-old chickens of which the sex has not been determined, may be obtained. Although the term "pullet day-old chickens" is given to chickens which a licensed person claims to be pullet chickens, there may be cockerels among them. Usually one

can expect in every 100 pullet day-old chickens about five cockerel chickens. Cockerel day-old chickens may be easily identified by farmers, for after the sex has been determined they are sprayed with a purple stain. This error varies a little either way, but 5 per cent. may be taken as an average. Among day-old chickens of which the sex has not been previously determined usually 50 per cent. of either sex will be found.

Culling.

All chickens reared may not be satisfactory producers. Weedy and poorly grown birds are not worth keeping for production and should be disposed of as early as possible. Some culling should be practised during the early stages of production, and again at the end of the first year's production. In fact, where the flock is of sufficient size, culling should be done from day to day.

Rearing Young Chickens.

Rearing chickens is not difficult. If only a few chickens, say 50, are bought, they can be brooded without any elaborate equipment; but if bought in batches of hundreds brooders are most desirable. It is considered that a farmer would be better served by buying a brooder than by making use of home-made contrivances, as it is little use buying expensive chickens to lose them by a saving of a pound or so on a brooder. Notes on brooding may be obtained on application from the Department of Agriculture and Stock.

Feeding.

Feeding Chickens.—To ensure the best development, correct feeding is necessary. For the first eight weeks, a ration having a protein level of from 18 to 20 per cent. is most desirable. Suitable rations may be purchased. They may, at first sight, appear costly, but the chicken eats very little during this period, consequently the added cost of proper feeding is not too much, and it is most essential to give the chicken a good start in life. Later, cheaper foods can be used. To illustrate the small food consumption per 100 chickens, the following table is given:—

FOOD CONSUMED PER 100 CHICKENS.

	Leghorns.	Australorps.
	Lb.	Lb.
First four weeks	40	45
First eight weeks	340	400

Feeding Laying Stock.—Layers are generally fed on mash and grain. However, satisfactory production may be obtained when layers are fed grain only and have skim milk to drink. One gallon of skim milk to each 20 fowls will supply all the protein of animal origin that the birds require. Farmers supplying particulars of the foodstuffs available can be advised as to how it should be fed, and what additional foodstuffs that should be procured to be fed in combination with the home-grown product. The preparation on the farm of a mash may become a problem too big for the small egg producer, and he may find it more convenient to buy a prepared mash.

Marketing.

Eggs are the principal product that the poultry raiser has for market. With the small producer the biggest fault is to accumulate supplies until case lots are obtained, consequently by the time of market delivery, eggs will have depreciated greatly in quality, resulting in much lower values for a large proportion of the consignment. To realise highest values, eggs should be marketed at least twice a week. Where the farmer has not enough eggs to make up case lots, it would be advisable for him to link up with a neighbour in forwarding composite consignments. Each contributor to any composite consignment to the Egg Board is paid by the Board for his own eggs directly, and, under such conditions, an equitable distribution of incidental charges may be arranged.

SALT FOR STOCK.

The Minister for Agriculture and Stock (Mr. T. L. Williams) has announced that many graziers were urging the release of salt and other lick ingredients for sheep in the drought-affected areas.

Mr. Williams pointed out that most bore waters contained salt and that frequently sheep obtained more than was sufficient in their drinking water for their well-being. It was then obviously unnecessary and wasteful to provide further salt.

The salinity of waters could be determined accurately only by analysis, and he had arranged with the Agricultural Chemist of his Department to analyse all samples of water, whether from graziers or farmers, free of charge.

Mr. Williams further announced that he would make the full-time services of Dr. Montgomery White available for the purpose of advising graziers on the most economical and satisfactory manner of conducting their feeding programmes.



Plate 179.
INSECTIVOROUS GULLS IN ACTION.

GADGETS AND WRINKLES

TANK MEASUREMENTS

TANKS WITH IRREGULAR SIDES.

EXAMPLE 8.

Add together length at top of both sides and divide by 2 for mean top length.

Add together length of both ends at top and divide by 2 for mean top width.

Add together length at bottom of both sides and divide by 2 for mean bottom length.

Add together length of both ends at bottom and divide by 2 for mean bottom width.

Multiply mean top length by mean top width.

Multiply mean bottom length by mean bottom width.

Multiply sum of top and bottom mean length by sum of top and bottom mean breadth; add these three last results together; multiply by depth; divide by 6 for cubic feet, and the result by 27 for cubic yards.

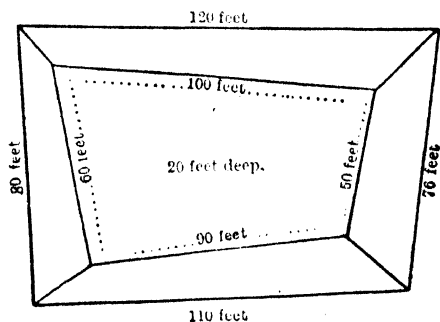


Plate 180.

Top	$120 + 110 = 230 \div 2 = 115$	} Top
	$80 + 76 = 156 \div 2 = 78$	
Bottom	$100 + 90 = 190 \div 2 = 95$	} Bottom
	$60 + 50 = 110 \div 2 = 55$	
Top Area	$= 115 \times 78 = 8970$	
Bottom Area	$= 95 \times 55 = 5225$	

$$210 \times 133 = 27930$$

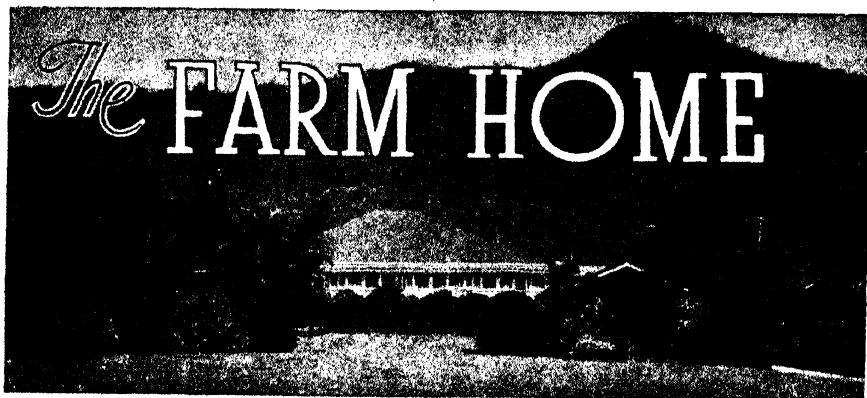
$$42125$$

20 ft. deep

$$6)842500$$

$$27 \left\{ \begin{array}{l} 3)14041\frac{1}{3} \text{ cubic feet} \\ 9)46805-1 \\ \hline 5200-5 \end{array} \right\} 16\frac{1}{3}$$

Contents = 5200 cubic yards $16\frac{1}{3}$ cubic feet.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BABY'S MILESTONES (PART II.).

Learning to Talk.

A COMMAND of one's mother tongue is a necessary foundation for a liberal education. Whatever our lot in life it is a distinct advantage to be able to express thoughts and emotions in a fluent attractive way, and for this reason most parents would wish their children to have this accomplishment, for they are responsible for their children's ability to talk well or otherwise.

A baby begins practising talking very early in life. He finds that it is fun to make noises and experiments for the sake of the pleasure he gets out of it. Actually a baby of six months experiments and practises with very many more sounds than he will ever use when he finally settles down to real talking.

The important thing which parents should realize is that a baby understands words long before he forms and uses them. He may show that he does so by kicking or cooing when his feeding time is mentioned, or pointing when asked where is little brother or the puppy. But whether he does this or not, it should be remembered that he is shaping his language according to the model his parents and brothers and sisters are presenting to him. A baby can only repeat what he hears, and if the sounds he hears are badly formed and carelessly spoken words, slang or swearing, the day will come when, like a gramophone record, he will reproduce these sounds.

It is only by constant painstaking effort that faults of speech and pronunciation can be corrected once they have become fixed during a child's pre-school years, and so it is the manifest duty of every parent (and those who have their children's welfare at heart will realize this) to improve their own speech, *inflections and idioms* so that the children in their turn will speak correctly and attractively.

There may be a period in his school days when a boy who has been taught to speak correctly thinks it is manly to speak roughly and use slang expressions, but that will pass and he will revert to the type of speech he learnt in his home training.

Learning to associate words with things and situations will usually proceed slowly or quickly, according to the opportunities provided by the mother or guardian who is with the child all day. A silent mother makes a silent baby, while a mother who is a good commentator on life helps her child to understand it. At eleven to twelve months old, the average child says single words, and by two years he is usually able to make these words into short sentences.

If a child is not talking by that age, it is a good plan to have the child examined by a doctor. If he has been having regular "check-ups" at a Child Welfare Centre, his progress will have been carefully noted and any defects referred to the appropriate quarter for correction, but if not it is advisable to ask a doctor what he thinks. Children may not try to talk at the right time from laziness, some degree of deafness,

or bad management in the home causing the child to become bewildered, resentful and what is known as negative. The earlier speech defects are taken in hand, the sooner will they respond to treatment; so parents should not hesitate to obtain expert advice on this important point.

Questions on this or any other matter concerning Maternal and Child Welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

SOUPS.

The best base for soup is lean and uncooked meat in the proportion of a pound to a quart of water. Meathones well broken up and added lend a very delicate flavour. A combination of meats, such as beef, mutton, veal, and ham-bones, will make a higher-flavoured soup than any one meat. It is well to remember that it is the meat and bones from the legs that are rich in gelatine, and these should be purchased in preference to all others for soup making. Soup should have merely the flavour of salt, and there should be in it the warm tone which the judicious use of pepper gives. Other flavourings are sage, thyme, mint, parsley, bay leaves, mace, cloves, celery seed, and onions.

Ten-minute Soup.

Take 2 oz. butter, 2 oz. flour, 2½ pints milk and water or milk and white stock, 3 or 4 tablespoonfuls tomato sauce, seasoning.

Melt the butter, add the flour, and mix them until well blended. Stir in the milk and water or stock and stir until the soup boils and thickens. Let it boil gently for a few minutes, then add tomato ketchup and seasoning to taste. If liked, a few drops of cochineal may be added to improve the colour of the soup. If too thick, thin the soup down with a little more liquid. This makes an excellent emergency soup.

Tomato Soup.

Take 2 lb. tomatoes, 2 pints water, 1 oz. butter, a few celery seeds or a small piece of celery, 1 carrot, 2 onions, cornflour, salt and pepper, sugar, 1 clove garlic.

Prepare the carrot and onion and cut them in slices. Melt the butter and cook the vegetables in it for a few minutes without letting them brown, then draw the pan aside and add the tomatoes cut in slices, the water, garlic, and celery. If using celery seeds tie them in muslin. Cook the vegetables until tender, then remove the garlic and celery seeds, and rub the soup through a sieve. Return it to the pan, season with salt and pepper, and a little sugar if liked, and thicken it with a spoonful of cornflour mixed to a smooth paste with cold water. Boil the soup for a few minutes and serve it with croutons.

Mulligatawny Soup.

Take 1½ lb. scrap of mutton, 3 pints cold water, about 1½ oz. dripping, 2 carrots, 2 onions, 2 small apples, a few mixed herbs, a small piece lemon, 3 dessertspoonfuls flour, 2 teaspoonfuls curry powder, 2 or 3 dessertspoonfuls rice, seasoning.

Scrape, wash, and slice the carrots. Peel and slice the onions. Peel and quarter the apples and remove the core. Melt the dripping in a saucepan, add the carrot, onion, and apple, and fry until lightly browned. Stir in the flour and curry powder and fry again for a few minutes, then draw aside. Cut the mutton into small joints and add to the vegetables, with the water, herbs—tied in muslin—and seasoning to taste. Bring all slowly to the boil, remove the scum, and simmer for about two and a-half hours. Take out the meat and herbs and rub the soup through a sieve. Skim off any fat from the top, then reheat the soup. Squeeze in a little lemon juice and serve. Have ready the boiled rice and serve separately. If necessary, add a few drops of browning to the soup just before serving.

To prepare the rice, wash it well. Put it into a saucepan of boiling water, with a little salt added, and boil until tender—it will take about fifteen minutes. When cooked, strain it through a colander, pour cold water through it to separate the grains, then place on a dish in a warm oven to dry, and reheat.

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Volume 59

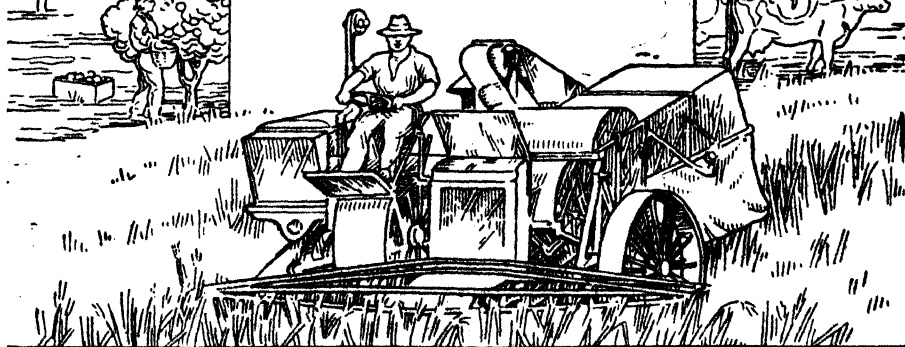
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QUEENSLAND AGRICULTURAL JOURNAL

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Part 1

Event and Comment.

Food is Part of the Armament of Victory.

ON the free countries of the world still rests the obligation of contributing to the urgent food requirements of countries now regaining some measure of their former liberty as a consequence of the continued success of the Allied attack. It has to be remembered, too, that food has to be taken over every ocean to the Allied armies, and also to the hungry peoples they set free in every mile of their advance to victory. For the people of Britain also, essential food supplies must be kept up. Therefore, the necessity of maintaining food production to the limit of our means and opportunity is as urgent as ever. For us, there is a second *second* front, and that front is marked by the crop land on our farms and the grass land on our pastoral holdings; it is a front on which food producers have been doing splendidly during *all* the years of war and it is a front which must be maintained, for food is definitely part of the armament of victory.

Our Land and Water Resources.

APPOINTED under the provisions of *The Land and Water Resources Development Act of 1943*, the Bureau of Investigation has under consideration, among other proposals, the possibilities of developing the water resources of the Lockyer and Bremer Catchment Areas. An investigation of the underground water supplies of the Lockyer region has already been made by the Irrigation Department, and a similar investigation is in progress in respect of the Bremer area.

Lockyer Creek, with its principal tributaries—Buaraba, Laidley, Tent Hill, Ma Ma, and Flagstone Creeks—drain an area of 1,132 square miles, above its confluence with the Brisbane River north of Lowood. The aggregate area now under irrigation from both open water and well

supplies in the valleys of these streams is 11,000 acres. Irrigated cultivations in this and the contiguous Bremer Catchment Area are cropped mainly for vegetables and green stock feed, and their importance as sources of supply to metropolitan markets is considered by the Bureau to warrant close examination of the potentialities of water conservation in each district. The relationship between open and underground waters in both valleys has yet to be determined, but that will be established when practicable so that appropriate measures may be taken to conserve sufficient water to provide for future extension by farmers of areas now under irrigation.

Weiring projects in the Lockyer Valley have already engaged the attention of the Irrigation Department. One weir is complete and two more are under construction on Lockyer Creek between Gatton and Lowood, and the Bureau proposes to investigate the problem as to whether the weiring of the streams will stabilise the underground waters in the water-bearing sands and silts along the valley flats, in addition to providing open water storage.

In the course of a recent tour of inspection by the members of the Bureau, many farms along the Lockyer and Bremer, on which irrigation plants are in operation, were visited and potential weir sites along the several watercourses were inspected.

Investigation of several other regions where soil and water resources, rural amenities—including good roads and availability of electric power—are similar to those of the Lockyer and Bremer Valleys is also claiming the close attention of the Bureau. Co-ordination between the Bureau and the Department of Agriculture and Stock has been established, and matters relating to soils, crops, methods of cultivation, application of water, measures taken to attain high production and maintain fertility are discussed with field officers of the Department on the ground.

The Soy Bean in Queensland.

REFERRING recently to the remarkable development of the soy bean industry in the United States, the Minister for Agriculture and Stock (Hon. T. L. Williams) predicted the early establishment of this crop on a substantial scale in Queensland, as a result of departmental trials now in progress. It was hoped, he said, to conduct more extensive trials with several varieties which have shown promise as a crop in general cultivation under Queensland conditions.

The Department of Agriculture and Stock has had many varieties of soy bean under trial for several seasons past, and some promising varieties of both grain and fodder types have been selected for further field tests. Shortage of staff and the wartime necessity of concentrating on increased production of established food crops has, naturally, limited experiment work. To establish soy bean production on a sound basis, it will be obviously necessary to select a type, or types, which will prove suitable under local conditions, but also which can be harvested mechanically, so that the crop may be grown at a cost which will attract the attention of both producers and consumers.

It should be distinctly understood, however, that *no seed stocks are at present available for distribution to farmers* by the Department of Agriculture and Stock, and that the small quantities of several varieties now held are required exclusively for trial purposes.

Field Crops

Growing Maize for Grain.*

C. J. McKEON, Director of Agriculture.

THE demand for locally-grown grain for stock-feeding and other purposes is so heavy that many farmers will, during the coming summer, attempt to produce all or most of their own requirements of maize or other grains. In the drier agricultural districts, grain sorghums will be largely favoured, but where rainfall is adequate maize will be planted extensively. Provided the land is well drained, maize can be grown on any good-quality soil in the coastal and adjacent districts and on the eastern Darling Downs, the alluvial flats along river and creek banks and deep volcanic soils being particularly suitable for its growth.

Preparation of Seed-bed.

To obtain the best results, the crop requires a good soil in which a plentiful supply of plant food is available; early and thorough preparation of the land before planting, and strict attention to the young crop and to the eradication of weeds during the early stages of growth are also essential to success.

The land should be ploughed to a depth of at least 9 inches during the winter, and allowed to lie in the rough until the early spring. The action of the rain and frost will have a sweetening effect on the soil and will leave it in a mellow condition. In the early spring, the land should receive a second ploughing which, if possible, should be a cross-ploughing. This should not be as deep as the first and should be immediately followed by a harrowing and cross-harrowing to work the surface soil into fine condition.

If a crop of weeds is turned under during the second ploughing, sowing should not be carried out for some weeks in order to allow decomposition to take place. On the lighter soils, but more particularly on those which are inclined to dry out readily, this will be greatly assisted by rolling, as the rolling will consolidate the soil and thereby accelerate decomposition of the weeds which have been turned under. Rolling should always be followed by a light harrowing.

The preparation of the seed-bed is one of the most important operations in the production of maize, and no amount of after-cultivation will undo the damage that has been caused by sowing on badly prepared land. The crop should be given a chance to become

* A comprehensive bulletin on maize growing is obtainable from the Department of Agriculture and Stock, Brisbane.

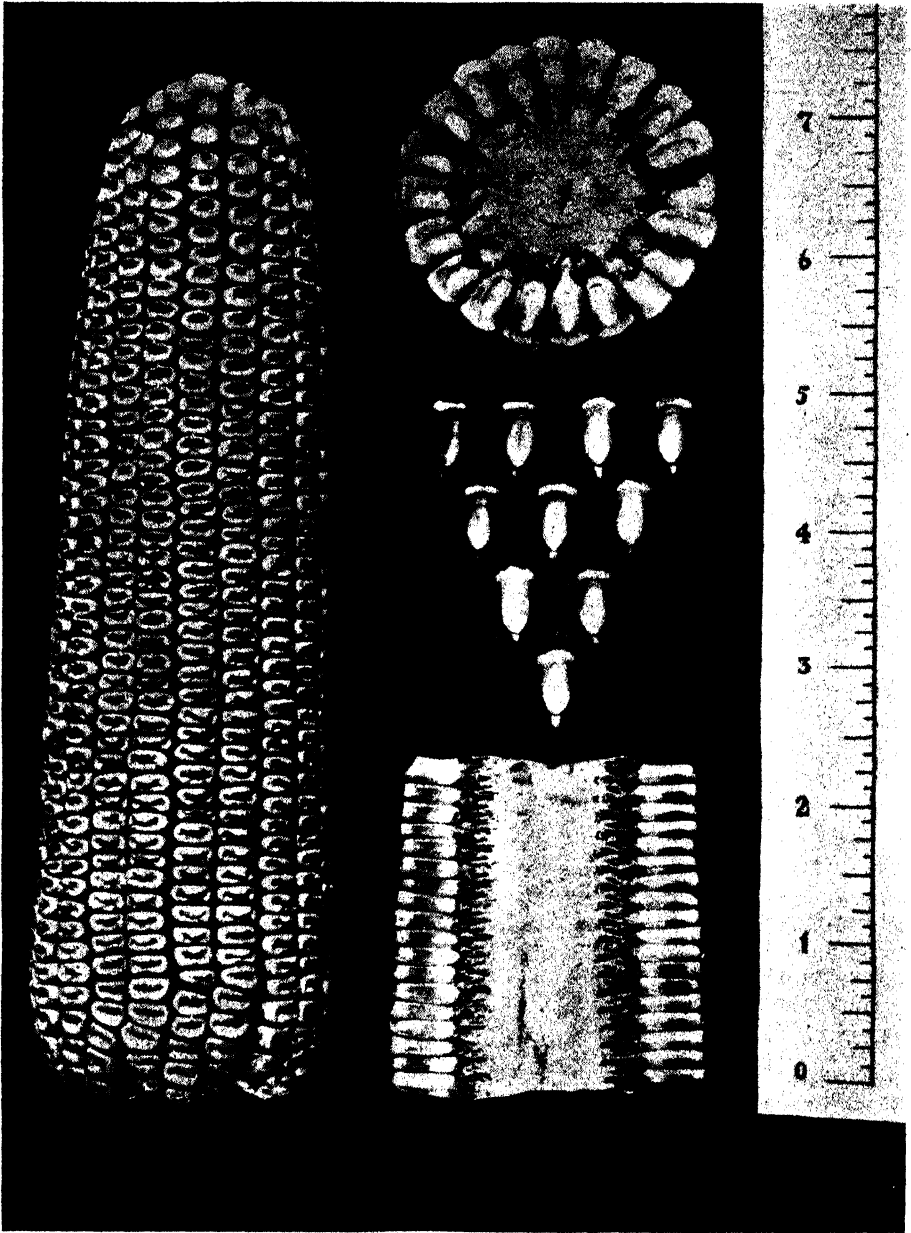


Plate 1.
FUNK'S 90-DAY.

thoroughly established in a well-prepared seed-bed in which the young plants will not have to battle with a host of weeds. The increased return will more than compensate for the extra time and labour spent in the preparation of a really good seed-bed.

Sowing.

The best time to sow maize for grain will naturally depend on local conditions. In districts which have a long growing season and a comparatively well distributed rainfall, sowings may be made whenever weather conditions are suitable from August to late December. In districts where early frosts are likely to occur it is not advisable to sow later than the middle of December unless a quick-maturing variety is grown, in which case sowing may be carried out as late as the end of December.

Two very important points in connection with the sowing of the crop are, firstly, the choice of a variety which has proved suitable for the district, and secondly, the arrangement of sowings so that the crops will tassel at a time when there is a likelihood of rain occurring. Maize requires moist conditions during tasselling, and if hot-dry winds occur then the pollen is destroyed and fertilization cannot take place.

When grain production is the objective, seed should be sown in drills spaced not less than 3 feet 6 inches apart, nothing less than 4 feet spacing being adopted for the tall-growing, late-maturing varieties. The spacings mentioned are for average good soils in districts enjoying a reasonably good rainfall; in drier districts, however, or on poorer classes of soil, the distance may be increased to as much as 4 feet 6 inches. As a general rule, single spacing in the drills gives the most satisfactory results, the grain being dropped singly along the drills with a distance of approximately 12 inches between the individual seed for the early-maturing varieties and from 15 to 18 inches for the late-maturing varieties. From 8 to 10 lb. of seed is sufficient to sow an acre when sown in this manner.

By far the most satisfactory method of sowing is with a seed drill, as by the employment of that implement it is possible to get an even spacing and no loss of moisture occurs, as is often the case when furrows are opened for hand planting. Either single or double-row seed drills may be used, according to the size of the area to be sown. Several different makes are available, each of which can be adjusted to sow the grain at the desired depth, the rate of seeding being regulated by the use of a plate with holes of the required size and number.

In districts where the rainfall is heavy and difficulty is experienced in keeping weed growth in check, many growers run out shallow drills a few inches deep with a light plough or other suitable implement and then sow along the bottom of the drills with a seed drill. When the young maize plants are high enough, the cultivator is worked through the rows and is set in such a way that the soil is drawn in round the plants, filling up the depression made when drilling and thereby smothering the young weeds which have sprung up in the rows. To be effective, this must be done while the weeds are very young. Such a procedure is also of value in areas where the top soil is liable to dry out quickly.

Varieties.

Practically every variety of maize shows great variability in type due to the fact that, unlike wheat, it is not naturally self-fertilized.

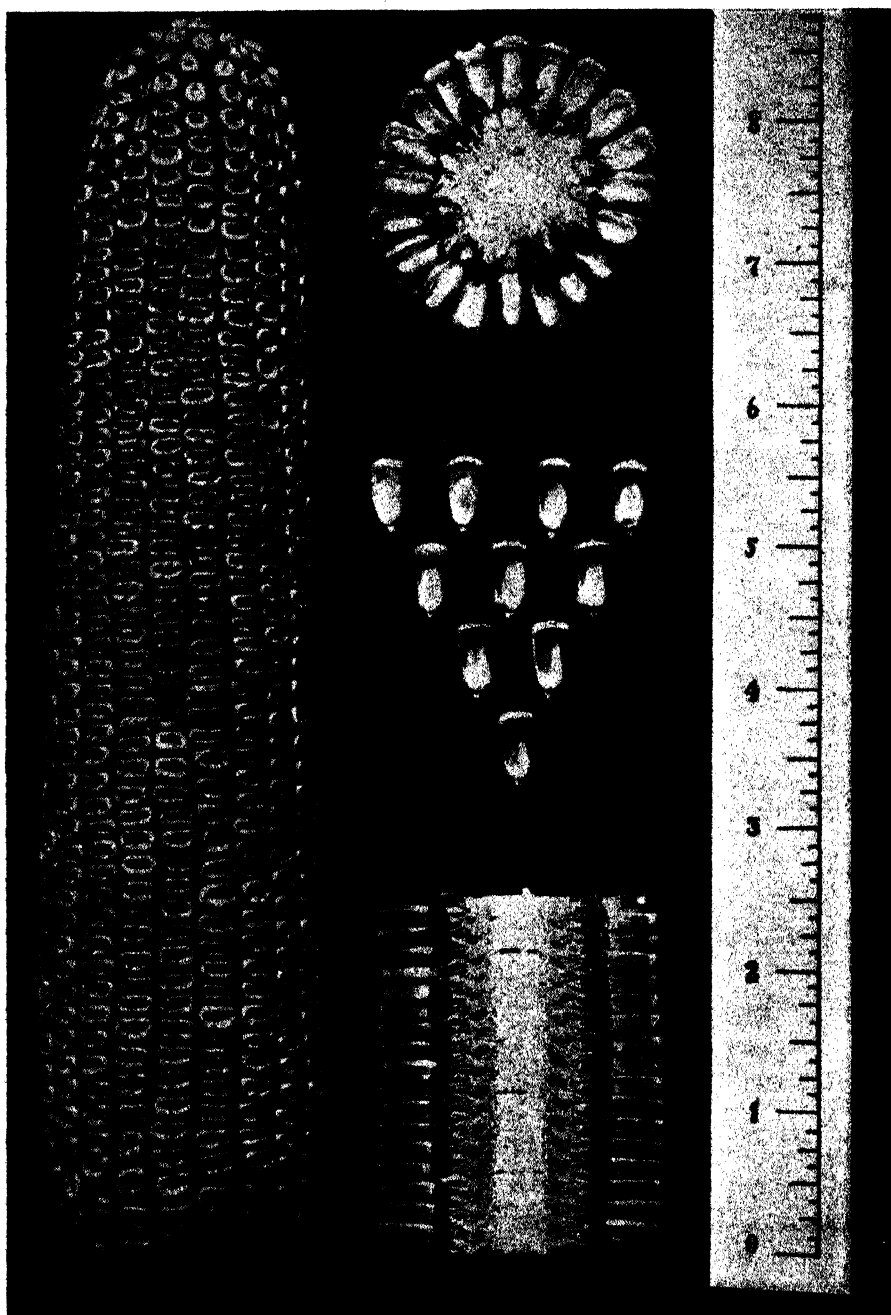


Plate 2.
STAR LEAMING.

Anyone who has been in a field of maize during the tasselling period and has seen the cloud of pollen which is carried throughout the field by wind can readily appreciate the amount of cross-fertilization which takes place. The constant crossing of the different genetic types causes great variability, and consequently there is not the same uniformity of type, even in varieties which have been kept absolutely pure and have been carefully selected for many years, as in those cereals which are self-fertilized. Environment also has an effect on type. Quite frequently the type of a particular variety is also changed through a grower having a fancy for a type other than the predominant one and selecting closely to that type each season.

It is evident that even the best and most carefully selected varieties will show at least some variation in type, and in giving a description of any variety the type which occurs with the greatest frequency is that which is used as a standard.

It will also be readily seen how quickly any variety can lose its varietal characteristics as a result of excessive cross fertilization, particularly in closely-settled districts, through being grown in close proximity to another variety. This unfortunately frequently occurs and large areas are sown annually with maize which bears little or no resemblance to the varietal name by which it is called.

As maize is grown in many districts throughout the State, there is naturally a considerable range of varieties and so-called varieties in use. The poor yielding and otherwise unsuitable varieties are, fortunately, fast disappearing, and one only has to see the excellent quality and trueness to varietal type of the grain exhibited at the different agricultural shows to realise that most growers are now using those better varieties which are most suitable for their particular districts.

The following varieties are those which are recommended for Queensland conditions.

Funk's 90-Day.

This variety (Plate 1) was introduced from the United States of America some years ago, and is now extremely popular with growers. It is an early-maturing, fairly short-growing variety, and for a quick-maturing maize it is a very heavy yielder. The ears are of fair size and usually carry from sixteen to twenty rows of very closely-packed grain. The grain is plump, of good depth, and slightly pointed, with an amber-coloured base and a rich yellow cap and a crease dent to a slightly rough dent. This variety is highly recommended for early crops, or for districts which have a short growing season. Yields of up to 100 bushels an acre have been obtained under field conditions from departmental plots; it requires 100 days or more to mature.

Star Leaming.

This is a medium early variety (Plate 2) and takes approximately four months to mature. It is without doubt one of the best all-round varieties grown in Queensland. For a fairly quick-maturing variety the ears are large, slightly tapered, and carry from sixteen to twenty rows of very closely-packed grain. They are particularly well covered, are borne low on the stem, and turn down during ripening. The grain is slightly larger than that of Funk's 90-Day, and is also of a brighter amber colour. It is a valuable variety for early or catch crops

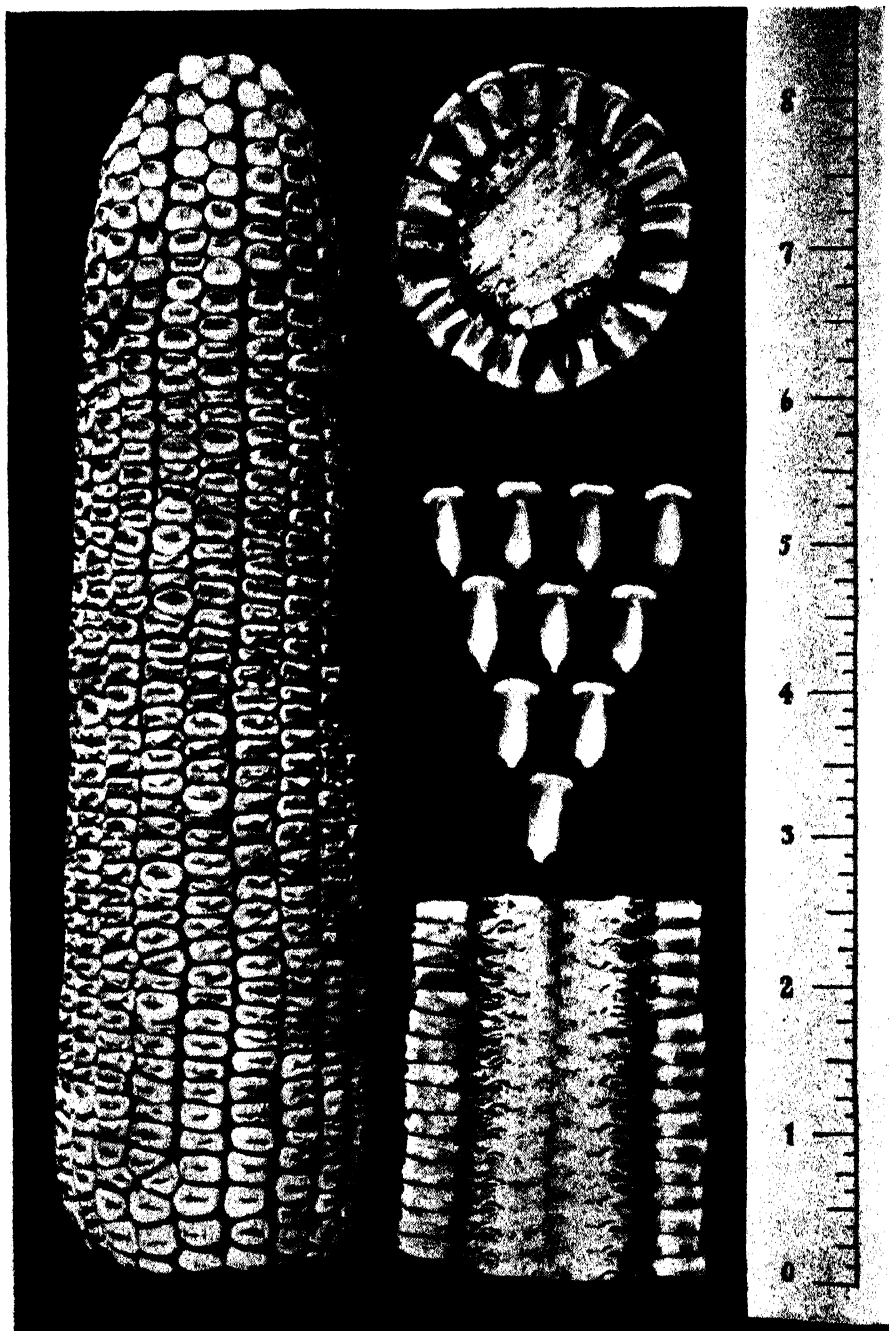


Plate 3.
REID'S YELLOW DENT.

and has proved to be suitable for any district, but particularly for the inland regions which have a low rainfall. Yields of 90 bushels have frequently been obtained. It is also an excellent maize for fodder.

Reid's Yellow Dent.

This is a moderately tall-growing variety (Plate 3) which takes much the same time to mature as Star Leaming. The ears are cylindrical in shape, of good size, and usually carry from sixteen to twenty rows of very tightly-packed grain. The grain is a pale amber colour at the base, with a creamy-coloured cap and a rough crease dent. The stalks are light and leafy, and make excellent fodder. Like Star Leaming, this is a very suitable variety for early cropping and for districts which have a short growing season. It is an exceptionally heavy yielder, and yields of over 100 bushels have been obtained.

Funk's Yellow Dent.

The growing period of this variety, and many of its habits of growth, are very similar to those of Reid's Yellow Dent. The grain also bears a close resemblance, the only difference being that it is somewhat squarer on the crown and has not so rough a dent. It is also a very good variety for early sowing, but is not quite as heavy a cropper as Reid's Yellow Dent.

Golden Beauty.

This is a fairly tall-growing ~~medium~~ late variety (Plate 4), taking approximately four and a-half to five months to mature. The ears are long with a very light core, and usually carry twelve rows of grain. The husk covering is particularly good and the ears turn down very well when ripening. The grain is not so deep, but is much broader than that of the varieties already discussed. It is bright amber in colour with a cream-coloured cap and a long crease dent. This variety is an excellent yielder, is very hardy, and will stand up to dry conditions much better than most varieties. The grain, when shelled, makes a particularly attractive sample and can command top price on the markets.

Improved Yellow Dent.

This variety (Plate 5) is now also known as Fitzroy, thus causing considerable confusion, for many growers are purchasing seed thinking they are getting some new variety. It is a late-maturing maize, taking approximately five and a-half months to mature, and is without doubt the heaviest cropper grown in Queensland to-day. The ears are large and cylindrical in shape, usually with sixteen to eighteen rows of grain. The grain is deep and wedge-shaped, of a rich amber colour, with a bright yellow cap and a rough crease dent. The husk covering is very good. For coastal districts and rain-forest lands, where there is a good rainfall, this is definitely the best of the late-maturing varieties. A yield of 117 bushels an acre on one occasion was obtained from an 8-acre departmental propagation plot of this variety in the Imbil district.

Durum.

This variety was bred and selected to meet the requirements of the Atherton Tableland where soil and climatic conditions, which include a generous summer rainfall and a moist atmosphere, tend to exercise an

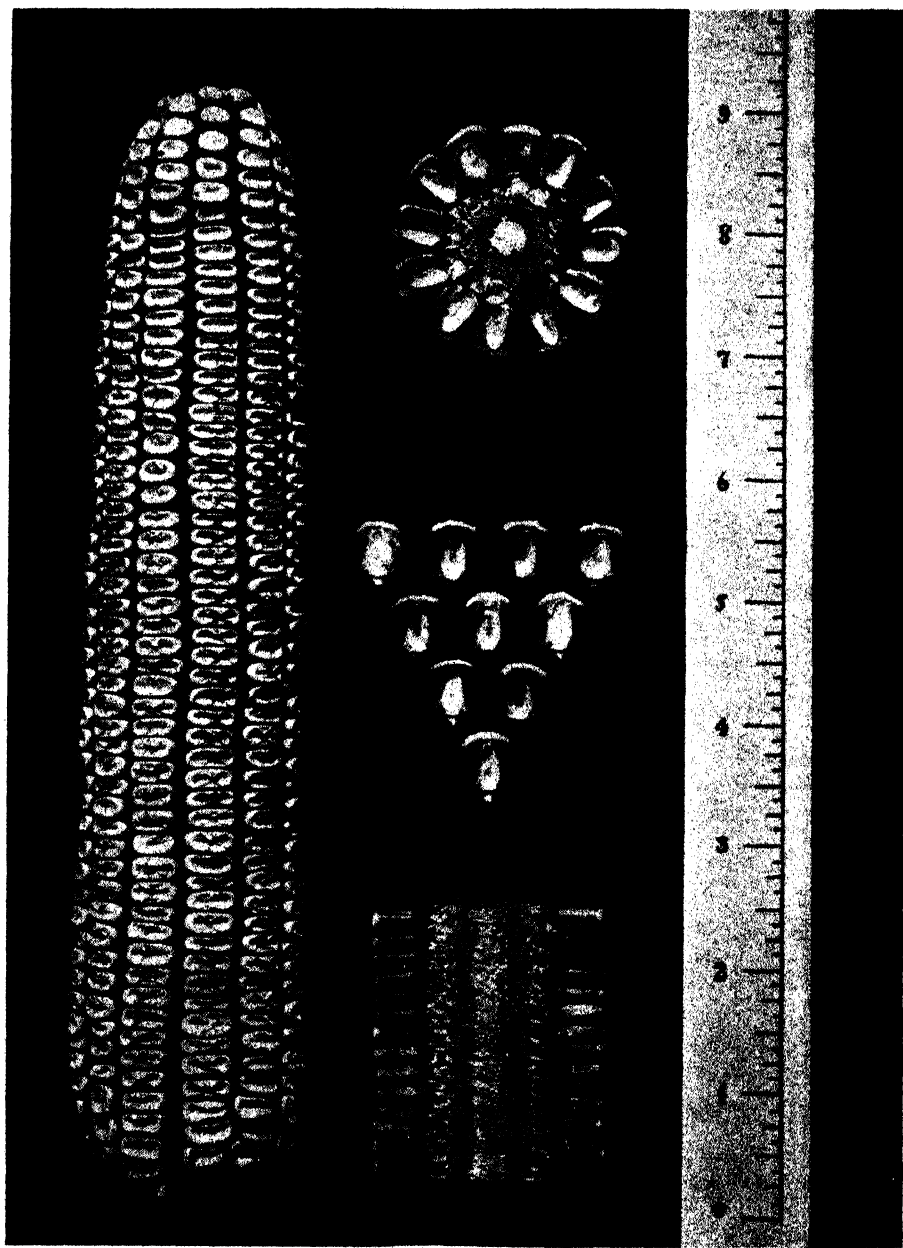


Plate 4.
GOLDEN BEAUTY.

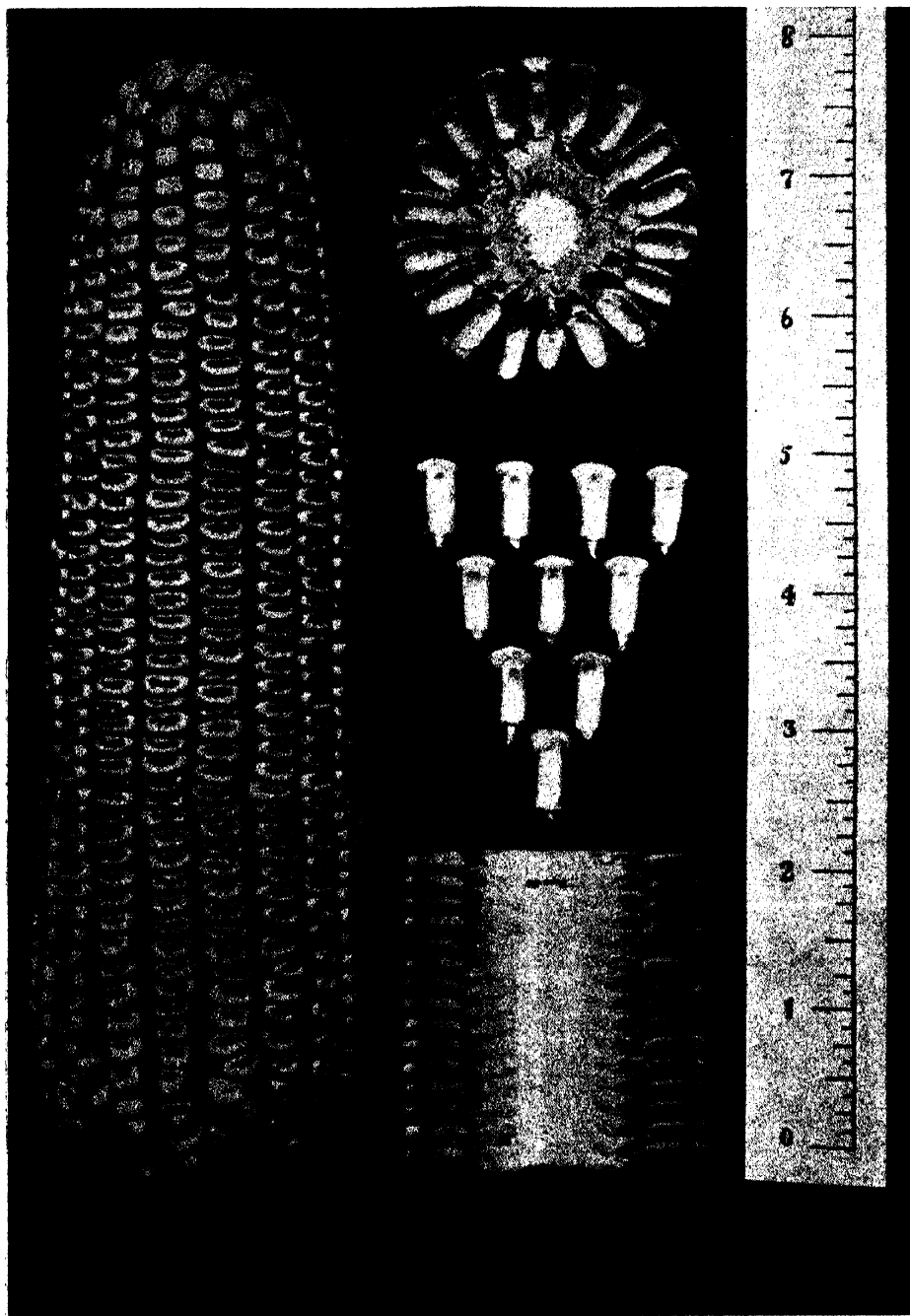


Plate 5.
IMPROVED YELLOW DENT.

adverse effect on the quality and texture of the grain. The Durum variety is harder in texture than the ordinary district-grown grain and is more resistant to *Diplodia* ear rot.

Cultivation of the Crop.

After sowing, the land can be harrowed even until the plants are a few inches high. Harrowing will not only destroy young weed growth but will also greatly improve the germination of the maize seed in the event of heavy rain falling shortly after planting and causing the surface soil to become caked.

Many growers are afraid of injuring the young crop, but if the harrowing is carried out on a bright warm day, when the young plants are not brittle, and care is taken to prevent rubbish accumulating under the harrows, the crop will not be injured and indeed it will be definitely benefited by the operation. A light lever harrow is the most suitable implement for this purpose.

The number of inter-row cultivations required will depend on the season and the freedom or otherwise of the land from weed growth. These, however, should be sufficient to keep the surface soil in a friable condition and also to keep weed growth in check. On no account should the surface soil be allowed to remain in a caked condition while it is possible to work a horse cultivator between the rows. As the crop becomes more advanced the inter-row cultivations should be carried out at a shallower depth in order to avoid injury to the roots.

Hilling.

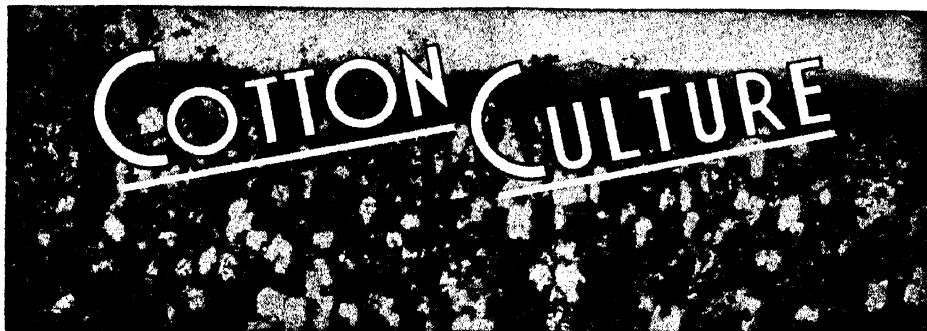
The chief advantage to be gained by hilling with a mouldboard plough or cultivator fitted with sweeps is that, during wet seasons, a heavy growth of weeds may become established in the rows, and hilling has the effect of smothering or keeping such growth in check. Apart from this, the practice has little to commend it.

Suckering.

The practice of removing the suckers is not recommended, as experience has shown that their removal not only does not increase the grain yield but, under certain conditions, the yield is actually decreased as a result of the injury suffered by the plants during the removal of the suckers.

WIRE NETTING.

Size.	Approximate Weight Per Mile.			
	"A1" Grade.	"A" Grade.	"B1" Grade.	"B" Grade.
	T. cwt. qr. lbs.	T. cwt. qr. lbs.	T. cwt. qr. lbs.	T. cwt. qr. lbs.
36 x 1 $\frac{1}{4}$ x 17 ..		1 8 0 0		1 5 0 0
42 x 1 $\frac{1}{4}$ x 17 ..		1 12 0 0		1 8 3 0
36 x 1 $\frac{1}{2}$ x 17 ..	1 4 2 0	1 3 2 0	1 2 1 0	1 1 2 0
42 x 1 $\frac{1}{2}$ x 17 ..	1 8 2 0	1 8 0 0	1 5 2 0	1 5 0 0



The Value of Rhodes Grass on Mixed Dairying and Cotton-growing Farms.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

INVESTIGATIONS conducted at the Biloela Research Station in the Callide Valley have indicated that the best yields of cotton are normally obtained during the first three seasons after virgin grassland is ploughed. Virgin grassland is, however, not always available on the farm and various cropping rotations in which cotton is an essential crop have also been extensively tested. One of these rotations, in which three years of Rhodes grass is followed by three years of cotton, before the pasture is re-established, has produced the next best yields of cotton. Information on the yields and quality of Rhodes grass obtained in this rotation indicates that it will enable the dairy farmer in the districts suitable for Rhodes grass to maintain satisfactory pastures for his cows.

Prior to the initiation of the investigations, it was generally thought by farmers that Rhodes grass grew well only on fertile scrub soils. On forest soils, yields of grass often declined very quickly, especially if the seed had been sown on poorly prepared seed-beds. Accordingly the yield and quality of the Rhodes grass produced in grassland-cotton rotations have been studied on a range of types of forest alluvial soils originally covered with either a mixture of ironbark and Moreton Bay ash or box or red gum (blue gum locally) and ironbark.

The results obtained show that Rhodes grass can be successfully grown on cultivated alluvial forest soils. On all but the less fertile sandy clay soils originally covered with stunted types of box trees and saplings, yields varying from six to twelve tons (green weight) of grass at hay stage have been produced by February during the first three seasons of growth. The amount and distribution of the rainfall has materially affected both the yields of grass cut at this stage and also the resultant regrowth after the mid-season mowing. It has been noticed, however, that the deep rooting habit of this grass—on some soils the roots penetrate 13 feet within nine months from sowing—enables it to withstand dry conditions better than annually planted fodder crops. This applies more particularly where the grass is in the first or second year of growth. It has also been noticed that Rhodes grass produces a new growth in the spring following light rains more quickly than do the native grasses; while in the winter, if a good growth of Rhodes

grass has been allowed to develop before frosts, although the top may have been frozen by temperatures as low as 22 degrees F., there has usually been an astonishing amount of green feed on the stool of the plant. In a dry winter, the winter growth in the first season of the grass has been equal in feed value to oats and wheat which have been partially checked by the dry conditions.

There is a tendency for yields of Rhodes grass grown on these forest soils to decline after the third year of establishment, particularly on the less fertile soils. Apparently Rhodes grass grows so vigorously that it utilises the available nitrogen in the soil so quickly that there is insufficient available after the third season to promote a satisfactory production of grass unless the soil is very fertile. This is evidenced by the decline in the crude protein content of the grass cut at hay stage, from 8 to 11 per cent. in the first year of establishment to 4 to 6 per cent. in the third year on fertile soils and 3 to 4 per cent. in the third year on the less fertile soils. Plate 6 illustrates how Rhodes grass in its sixth year on soil of only moderate fertility may be severely checked in growth. Some of the grass in the foreground has been cut to show the height of the grass in the centre of the field behind the person, as compared with the greener and taller growth around the edges of the field where the grass gets additional moisture and nitrogen from the adjacent cultivations.



Plate 6.

RHODES GRASS IN THE SIXTH SEASON OF ESTABLISHMENT ON FOREST SOIL OF MODERATE FERTILITY.

It appears advisable, therefore, to grow Rhodes grass on forest soils in rotation with either row-cultivated crops which do not use much nitrogen or legume crops which build up the supply of nitrogen depleted by the grass. Cotton appears to be the outstanding row-tilled crop to grow in rotation with the grass because it uses less nitrogen than other row crops grown in the Rhodes grass districts. In addition, the cultural practices required to produce a good crop of cotton also cause a marked increase in the activity of the micro-organisms in the soil which decompose the dead grass roots and make nitrogen available for following crops or grasses. After three years of cotton cultivation the nitrate

content of the soils of the Research Station increases sufficiently to allow the production of Rhodes grass which compares favourably in yield and quality with summer fodder crops such as Giant Setaria and Sudan grass grown on similar soils. Plate 7 illustrates the growth of Rhodes grass produced by December on a forest clay loam soil of medium fertility in the second year of establishment after three years of cotton cultivation. This field yielded approximately $3\frac{1}{2}$ tons of air-dried hay of good quality and produced a regrowth which would have provided good grazing for the winter. Undoubtedly dairy farmers in the districts where Rhodes grass grows well should use this grass more extensively as a crop in rotations on their cultivations.



Plate 7.

RHODES GRASS IN THE SECOND SEASON OF ESTABLISHMENT ON FOREST SOIL OF MEDIUM FERTILITY.

By having fields of Rhodes grass in the first, second, and third years of establishment each season, the average dairy farmer would provide markedly superior pasturage for the herd than exists on most farms. The grass would, in its first season, be grazed lightly so as to allow the development of a good growth by winter. This growth would protect the green "shoot" on the stools and thus provide good grazing during the winter months in most of the districts east of the Main Dividing Range. The field in its second year of establishment could be left for hay production and the regrowth grazed for the rest of the season. The field in its third year of growth should be grazed heavily from the start of spring until the end of the wet season when it should be ploughed in preparation for cotton in the following season. It is advisable to plough the Rhodes grass early in March if at all possible as a better supply of subsoil moisture will be conserved for the following crop than if ploughing is deferred until winter or spring. In one experiment it was found that March ploughing conserved moisture in the soil to a depth of 32 inches as compared with only 19 inches in June ploughing.

Growing Rhodes grass on slopes instead of annually planted fodder crops is also advisable to assist in reducing soil erosion. Investigations over a series of years have shown that, after three years of Rhodes grass, the rainfall enters the soil much more easily than in land cropped every

year. There is little if any run-off of storms of under 1 inch in the first year of row cultivation after grassland even on slopes with a drop of 5 feet in every 100 feet. Undoubtedly soil erosion could be effectively reduced if Rhodes grass pastures were used more extensively on the present cultivated slopes.

Summary.

It is recommended that farmers on mixed dairying and cotton-growing farms practise the Rhodes grass-cotton rotation. The use of this rotation markedly improves the yield and quality of the pasture and the yield of cotton. The Rhodes grass obtained in this rotation will compare favourably in both yield and quality with summer fodder crops such as Giant Setaria, millets, and Sudan grass produced on similar soil. In addition, the growing of Rhodes grass involves less cultural expense and reduces soil erosion, particularly on the hillside farms.

MISCELLANEOUS WEIGHTS.

GRAIN AND MILL OFFALS.

1 bushel of wheat	..	..	..	60 lb.
1 bushel of maize	..	..	..	56 lb.
1 bushel of barley	..	..	..	47 lb.
1 bushel of oats	..	..	..	40 lb.
1 bushel of bran	..	..	..	20 lb.
1 bushel of pollard	..	..	..	20 lb.

TIMBER.

300 super. feet ironbark averages	..	..	about	1 ton.
400 super. feet stringy bark	..	..	about	1 ton.
500 super. feet pine	..	..	about	1 ton.
600 super. feet kauri	..	..	about	1 ton.
600 super. feet cedar	..	..	about	1 ton.
800 super. feet oregon	..	..	about	1 ton.

WATER.

1 gallon weighs	..	10 lb.
11½ gallons weigh	..	112 lb.: 1 cwt.
224 gallons weigh	..	2,240 lb.: 1 ton.

BRICKS.

1 brick weighs	about	7 lb.
16 bricks weigh	about	1 cwt.
320 bricks weigh	about	1 ton.
1,000 bricks weigh	about	3 tons 1 qr. 28 lb.

Vegetable Production

Vegetable-growing in North Queensland.

By S. E. STEPHENS, Northern Instructor in Fruit Culture.

(Continued from p. 281, May, 1944.)

PART 4. THE VEGETABLE CROPS.

Cabbage.

THE main season for this crop throughout the northern area is late autumn to spring. The earliest crops are produced in the drier portions of the highlands, where the rainfall does not cause serious interference with the raising of seedlings. In such districts crops for harvest as early as March and April can be grown. The highlands will also produce late crops up to December, but for these irrigation is essential.

For commercial planting Copenhagen Market is the most suitable early variety. It is a tender type however, and shows a tendency to split quickly after reaching maturity. For main crop plantings Henderson's Succession and Enkhuisen Glory are the two varieties that give most general satisfaction. For the home gardener, who requires a small, quick-maturing type, Vanguard and Earliball have proved suitable varieties.

To attain success in growing any of the cabbage family, regular and quick growth is essential. The plants must not suffer a check, so must be supplied with ample water and plant food throughout their growth. In addition to receiving the basal dressing of complete fertilizer mixture, the plants should be topdressed with a nitrogenous manure. This may be in the form of sulphate of ammonia or nitrate of soda; or, for the home gardener, liquid manure. The usual rate of dressing is about 1 cwt. sulphate of ammonia or $1\frac{1}{2}$ cwt. nitrate of soda. Two dressings at this rate will produce best results, and should be applied to the side of the rows but not touching the plants. The first dressing should be given when the cabbage commences to form the heart, and the second about a fortnight later. If liquid manure is being used this should be made by filling a container of suitable size to one-third of its capacity with fresh farmyard manure and pouring in water to fill the container. This makes the stock solution and should be set aside for about a week to mature. When used for manuring plants it should be broken down at the rate of about one half-pint of stock solution to one gallon of water. Liquid manure at this strength should be used about once a week throughout the growing period of the crop.

Cabbages are subject to attack by various pests and diseases, control measures for which are given in Departmental advisory pamphlets.

Cauliflower.

This crop may be successfully grown in North Queensland only in the coldest portions, viz.:—Charters Towers and west thereof, and the

Evelyn Tableland. The cauliflower is very sensitive to temperature and humidity. High temperatures at transplanting affect the establishment of plants in the field, and heat during the maturing of the crop causes yellowing and fuzziness, and development of leafy growths through the curd. Dry atmospheric conditions prevent satisfactory growth of the plants. The climate required is therefore one with a cool, uniform temperature and abundant moisture. Successful crops are occasionally grown in the warmer parts of the north if the weather is unusually favourable, but satisfactory results cannot be depended upon.

In suitable-growing districts the variety that has given consistently good results is White Queen.

Spacing of plants should be wide enough to allow ample room for development. About 24 inches between plants and 36 inches between rows is recommended. Close crowding of cauliflowers should be avoided as it tends to reduce the size of the head. Culture otherwise is very similar to that required by cabbage, although the period of growth is somewhat longer. The same pests and diseases can be expected.

Green Sprouting Broccoli.

This vegetable is somewhat similar to an open-headed cauliflower, with the difference that the curd is green instead of white. Furthermore, after the main central head has been harvested, further heads develop in the leaf axils, thus producing two or more harvests from the one plant. This vegetable is well suited to the warmer parts of the North, where it thrives as a winter green. The growth period extends over about five months, the harvest extending over the last six to eight weeks of this period. The heads should be harvested before the curd commences to break, and the primary head should be cut with only one or two of the small youngest leaves. The balance of the plant should be left intact to develop the secondary heads. Planting distance should be as for cauliflower, otherwise culture is the same as for cabbage, and the same pests and diseases may be looked for.

Brussels Sprouts.

This crop, like the cauliflower, will produce well only in the coldest parts of the north. To attain perfection a long, cold winter is required. Success can be attained on the Evelyn Tableland, Charters Towers, and other western areas. On the Atherton Tableland sprouts of fair quantity can be produced if the winter is a cold one. Sprouts are a long season crop, and will occupy the ground for about six months. Under North Queensland conditions the crop is more suitable for the home gardener than for the commercial grower.

Choys.

Three types of choys are commonly cultivated in North Queensland.

Pe-tsai is the most widely cultivated type. It looks like a large blanched cos lettuce with broad, white, basal leaf stalks. The leaves are crepe-like, with toothed edges, and are clasped tightly together. Two varieties are commonly grown, viz., Pe-tsai and Wong Bok.

The Pak Choy type is widely grown by Chinese gardeners, and appears to be particularly relished by eastern people. It is non-heading and has cabbage-like leaves with entire edges. The leaves surmount

white, strap-shaped stems, and are almost circular in shape. The apex of the stem divides into a number of raised white ribs that radiate into the leaf blade.

The Gai Choy type has large, dark green, broad leaves, with pale-green stem and ribs. The leaf edges are distinctly toothed, and leafy outgrowths extend to the base of the leaf stems. This plant has a distinct mustard flavour, and in the East Indies is known as Indian mustard.

Choys all require the same cultivation. Rich soil and top dressing with nitrogenous fertilizer or regular liquid manuring are necessary to produce best results. Autumn and winter seasons in the warmer areas and autumn on the highlands are the periods for production of good quality. In the spring and summer months comparatively little leaf growth is produced, and the plants run rapidly to seed. The growth period is normally about five to seven weeks.

Kohl Rabi.

The edible portion of kohl rabi is the swollen fleshy stem. It develops into a round turnip-like vegetable above the ground, with the leaves springing from the upper two-thirds of the swelling.

Two varieties, namely Green and Purple, are grown. This vegetable will grow well throughout the whole northern area. In the warmer coastal areas it should be grown during the autumn and winter months, but on the highlands the season may be extended into spring and early summer. The crop should be grown rapidly and harvested whilst still quite young. Slow growth promotes woodiness, which renders the vegetable unpalatable. Over-mature specimens also have a woody texture.

Turnip.

This is one of the easiest of all vegetables to grow, and will thrive throughout the northern area. In the warmer coastal areas its cultivation should, however, be restricted to the cooler months. At other periods it has a tendency to become woody and strong in flavour. Turnips are sown in rows direct to the field, and thinned out at an early stage to about 4 inches apart. The plants removed in thinning out may be transplanted if desired. The crop should be harvested in six to nine weeks from sowing. White Stone is the standard variety and the one generally most successful throughout the North.

Swede Turnip.

This turnip is in greater demand on the market than the ordinary turnip, from which it differs in the colour and texture of the leaf and in the structure of the root. Swede turnip has smooth, bluish, slightly fleshy leaves like cabbage, and secondary and fibrous roots arising from the swollen root, whereas the ordinary turnip has thin, light green, hairy leaves, and swollen root free of secondary or fibrous roots.

The crop should be grown quickly to produce tender and succulent roots. The best quality product comes from the cooler parts of the area, such as Charters Towers, Atherton, and Evelyn Tableland, and the western areas. Swedes of very fair marketable quality can, however, be produced in coastal areas during late autumn and winter months. Sowing should be directed to rows in the field, with subsequent thinning

to about 9 inches apart. Broadcast sowing is sometimes practised, but this is not to be recommended, owing to weeding difficulties. Purple Top variety is recommended.

Swede turnips are particularly susceptible to attack by cabbage aphids, and for this reason it is most undesirable to plant them in proximity to cabbage or other greens of this family. They are a crop which normally does not command high prices, but owing to the ease with which they are produced are frequently planted fairly extensively. Owing to their small monetary value they are usually given the minimum of attention, with the result that they tend to become a breeding ground for cabbage pests. For this reason they should be strictly isolated, and, as soon as the profitable harvest has been collected from them the balance should be destroyed.

Radish.

The growth period of this crop is very short, hence good results can only be obtained when the soil contains plenty of readily available plant food. Radish will thrive on a wide range of soils, but a loose, friable soil gives best results. Seed germinates in about three days, and, as germination is usually high, it should be sown thinly to allow room for development of the roots without heavy thinning of the young plants. Seedlings are hardy and seldom affected by frost, so planting may be continued throughout the winter on the highlands, as well as during the warmer months. In coastal areas planting should be restricted to autumn, winter, and early spring months. In hot weather the roots quickly become pithy and useless so their development must be watched closely, and harvesting carried out as soon as they are ready. Suitable varieties are French Breakfast (globe type), Long Scarlet, and Long White Icicle. To maintain regular supplies planting should be undertaken about every ten days.

Okra.

This is an African vegetable not yet widely grown in this country, but popular in parts of America. It is a small shrub growing to about 3 feet in height. It requires a long warm season for successful growth, so should be restricted mainly to coastal regions. If grown on the highlands it should be planted in the spring so that it has the warm season ahead for full development. The optimum temperature for good germination of seed is above 80 deg. F. Soil should be nearly neutral in reaction. Plants should be set 12-24 inches apart in rows 3 to 4 feet apart. Seeds are usually sown direct to the rows in the field as the young plants are not easily transplanted. Flowers are produced singly in the leaf axils of the main stem and branches. They develop progressively from the base to the top of each branch, and when plants are growing strongly, open at the rate of one per day on each stem. The pods grow from 4 to 12 inches long. They should be harvested when about half grown, at which stage they can be cut across easily with a knife. Beyond this stage of growth they quickly become tough and woody. Maturing of pods on the plants will also seriously affect growth and productivity. Harvesting should be carried out every two days to avoid over-maturity of the pods. Where conditions of soil and climate are favourable yields of over 100 pods per plant can be expected.

French Beans.

This crop is divided into two classes, namely, dwarf and climber, the former being generally the more satisfactory commercial type,

because it is not necessary to erect trellis or pole supports for the crop. Beans require a well drained, friable soil. Soils with a tendency to crust formation are not desirable as the young plants may be unable to break through the crust and poor stands then result. Fertilizer trials on beans in this State indicate that a dressing low in nitrogen and high in phosphate gives best results. A mixture containing about 3 per cent. to 4 per cent. nitrogen and 12 per cent. to 15 per cent. phosphate applied at rates up to 6 cwt. per acre will supply the needs of this crop. Care should be used in applying fertilizer to a bean crop, as contact between seed and fertilizer may result in poor germination. Fertilizer should be placed below the seed and well mixed and covered with a layer of soil before the seed is planted.

Bean plants are injured by heavy frosts; very hot weather on the other hand may affect the setting of pods, causing the blossoms to fall. Seasons for beans in the North are therefore spring and summer for the highlands, and autumn, winter, and early spring for the coastal areas that are free from frost. In North Queensland the crop takes six to seven weeks to reach the flowering stage, and pods should be ready for harvest in about a fortnight from first flowering.

Brown Beauty and Canadian Wonder are generally the most reliable varieties for the North.

Bean fly is the most serious pest attacking this crop, and is prevalent throughout the year in coastal areas, and during the greater part of the year on the highlands. Spray will control its ravages, provided the proper spraying schedule is strictly adhered to.

French beans require harvesting about twice each week to ensure that the pods are in the correct stage of succulence. The correct stage for harvest is when the pods have attained their full growth, but before the outline of the seeds can be seen on the surface of the pods. At this stage the pods will snap cleanly across when bent. Such beans will retain their fresh condition for a reasonable time after picking. Immature pods, on the other hand, quickly wilt and become limp and shrivelled.

Long Beans.

These are strictly tropical beans that thrive during the hottest part of the year. In coastal areas they take the place of the French bean during the hot summer and wet season months. The planting season is September to February. These beans are climbing twiners, and give best results when provided with stake supports. One variety, however, is frequently grown on the ground as a sprawling bush. The customary method of culture is to plant in double rows about 24 to 30 inches apart. Light sticks, about 6 feet long, are then leaned from the rows to each side of a central wire or sapling ridge pole as illustrated in Plate 8.

First harvest from long beans may be expected in about seven weeks and the cropping period should extend over six to eight weeks. Long bean pods are produced successively on extending fruit stalks; therefore, care must be taken when harvesting mature pods not to injure the fruiting stems. The picking should be done by twisting the pods away from the growing point of the stems. The pods must be harvested whilst they are round and fleshy and before the seeds swell. They develop very rapidly, so harvesting must be carried out almost every second day.

Varieties that give best results are brown, black, and variegated seeded. The former produces a very long bean up to 22 inches, well rounded and fleshy, and has an extended cropping season. The black-seeded variety also produces long pods, but they are less fleshy than the brown-seeded ones. The variegated variety gives pods up to 12 inches long and usually has a shorter season than the brown-seeded type. It is the type that is sometimes grown as a bush.

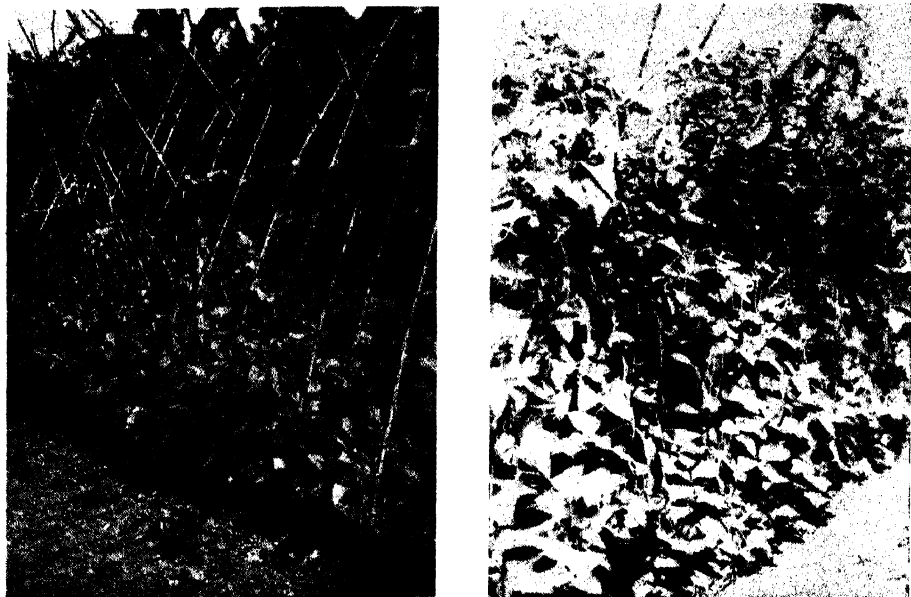


Plate 8.

LONG BEANS, SHOWING THE METHOD OF STAKING AND THE MATURE CROP.

Sword Bean.

This is another summer bean of very vigorous growing habit. It is an extensive climber and one plant will cover a considerable area. A trellis or wire netting fence is desirable for its support. The plant is resistant to the attack of bean fly. The pods are produced on extending fruit stems similar to the long beans, and when mature each pod may measure up to 15 inches long by 2 inches broad. The fully-developed seeds are about 1 inch long by $\frac{1}{2}$ -inch wide by $\frac{1}{4}$ -inch thick, red in colour with a black hilum on one edge extending almost the full length of the seed. For use as a vegetable the pods are harvested when not more than 6 to 8 inches long by 1 inch wide and before the seeds develop. The seeds when well developed are considered to be poisonous. In the immature stage the beans are crisp and fleshy and can be sliced and prepared in the same manner as French beans, requiring only slightly longer cooking. Seed is planted in tropical coastal areas in early spring. Cropping commences in about three months and will continue until the following winter.

Peas.

Strictly speaking, this is a cool-climate vegetable, and as such its satisfactory culture in North Queensland is restricted. The highland and inland areas are most suitable, but during the winter months a

certain amount of success may be attained in coastal areas. Soils for this crop should be no more than slightly acid in reaction, over pH 6 giving best results.

Fertilizer of high phosphate content is desirable—in fact, super-phosphate alone will usually give satisfactory results. Planting should be undertaken in early autumn so that maturity is reached during the coolest period of the year, as high temperatures at this stage of growth are conducive to poor cropping. Good surface cultivation and hilling of the rows assist in promoting vigorous growth.

Yorkshire Hero has long been the standard variety, but Greenfeast and Stratagem also give good results under Northern conditions.

WEIGHT OF STEEL WIRE.

Gauge.	Yards per cwt.	Weight Per Mile.							
		1 wire.	2 wires.	3 wires.	4 wires.	5 wires.	6 wires.	7 wires.	
No. 6	393	C. Q. L. 4 1 26	C. Q. L. 8 3 24	C. Q. L. 13 1 22	C. Q. L. 17 3 20	C. Q. L. 22 1 8	C. Q. L. 26 3 16	C. Q. L. 31 1 14	
No. 7	467	3 3 2	7 2 24	11 1 26	15 0 8	18 3 10	22 2 12	26 1 14	
No. 8	566	3 0 12	6 0 24	9 1 8	12 1 20	15 2 4	18 2 16	21 3 0	
No. 9	700	2 2 2	5 0 4	7 2 6	10 0 8	12 2 10	15 0 12	17 2 14	
No. 10	882	1 3 27	3 3 26	5 3 25	7 3 24	9 3 23	11 3 22	13 3 21	
No. 11	1077	1 2 15	3 1 2	4 3 17	6 2 4	8 0 19	9 3 6	11 1 21	
No. 12	1333	1 1 8	2 2 16	3 3 24	5 1 4	6 2 12	7 3 20	9 1 0	

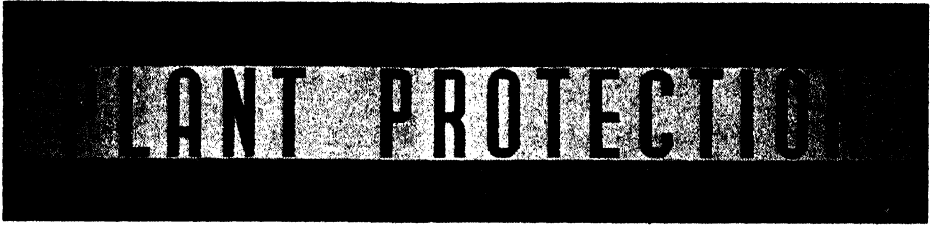
CORRUGATED IRON.

Number of Sheets in One Ton (approximate).

Ordinary 3 inch corrugations :—

GAUGES.						
	18	20	22	24	26	28
Length 5 feet	94	112	130	166	230	248
" 6 "	78	92	110	140	192	206
" 7 "	66	80	94	120	164	176
" 8 "	58	70	82	104	144	154
" 9 "	52	60	60	94	128	136
" 10 "	46	56	56	84	114	122

1 ton galvanized corrugated iron, 26 gauge, single lap ..	will cover about	Sq. ft. 2,200
1 ton galvanized corrugated iron, 26 gauge, lap and half	will cover about	2,000
1 ton galvanized corrugated iron, 26 gauge, double lap ..	will cover about	1,900
1 ton galvanized corrugated iron, 24 gauge, single lap ..	will cover about	1,600
1 ton galvanized corrugated iron, 24 gauge, lap and half	will cover about	1,500
1 ton galvanized corrugated iron, 24 gauge, double lap ..	will cover about	1,400



Pineapple Scale.

HUBERT JARVIS, Research Officer.

THE pineapple scale* (Plate 9) occurs in most parts of the world where its host plant is grown commercially in the field and also in cooler countries where pineapples are, or have been, grown in glass houses. Thus it was first described from Germany in 1788, long before pineapples became an important commodity in world trade, and it was later recorded from England in 1841. In Australia, the scale was collected in New South Wales in 1891 and subsequently listed in the "Descriptive Catalogue of the Scale Insects of Australia." In Queensland, an outbreak recently occurred at Rochedale; though localised, the infestation was very severe.

Description and Life History.

The pineapple scale is one of the hard-shelled scale insects, and, as is usual with this kind of pest, dense colonies are found on infested plants. The scale which covers the female is circular in outline and almost flat except for a slightly raised portion in the centre. It is approximately one-sixteenth of an inch in diameter and its colour is greyish-white. Underneath the scale is the translucent, slightly yellowish insect with hair-like mouthparts through which the sap is extracted from the tissues of the host plant. The scale covering the male is somewhat smaller and rather different in appearance from that of the female. It is roughly rectangular in shape and almost white in colour and carries three longitudinal ridges on the upper surface. On all infested plants there is a partial segregation of the two sexes, the circular female scales predominating on the leaves and the rectangular male scales at the base of the fruits and on the suckers.

The life history of this insect is similar to that of other hard-scaled species. Small yellowish eggs are laid by the adult female and hatch within a week. The minute, yellowish crawlers which emerge from the eggs leave the shelter of the parent scale and seek suitable feeding sites on the leaves, stems, and fruits of the host plants. Once feeding begins, the young insect secretes a covering scale which is typical of both the sex and the species. At the same time, the limbs become atrophied and are shed during one of the moults associated with growth. Growth then continues until development is completed, the whole process requiring approximately two months during the warmer part of the year. The adult female never leaves the point where it settled early in life and is always wingless. The adult male is, however, a very fragile, two-winged insect which emerges from the scale on completing its development, mates, and then dies. Several generations occur during the year.

* *Diaspis bromelliae* Kerner.

Nature and Extent of Infestation.

Heavily infested plants are conspicuous on account of the grey, scurf-like appearance of leaves, stems, and fruits which results from the presence of thousands of insects matted together into a crust over the surface. They show obvious signs of ill-health, which finds expression in the small size of the fruit, lack of vigour in the off-shoots, and a certain amount of stunting in growth. Such plants, however, are seldom killed outright.

Though described from pineapples and best known as an occasional pest of this plant, the scale is said to have several other hosts. These include the canna, English ivy, olive, and the sago and fan palms. In Queensland the insect has been recorded only from the pineapple. Both the Smooth Cayenne, the canning variety grown in Queensland, and the Ripley or Queen variety which is grown exclusively for the fresh fruit market, may be attacked.

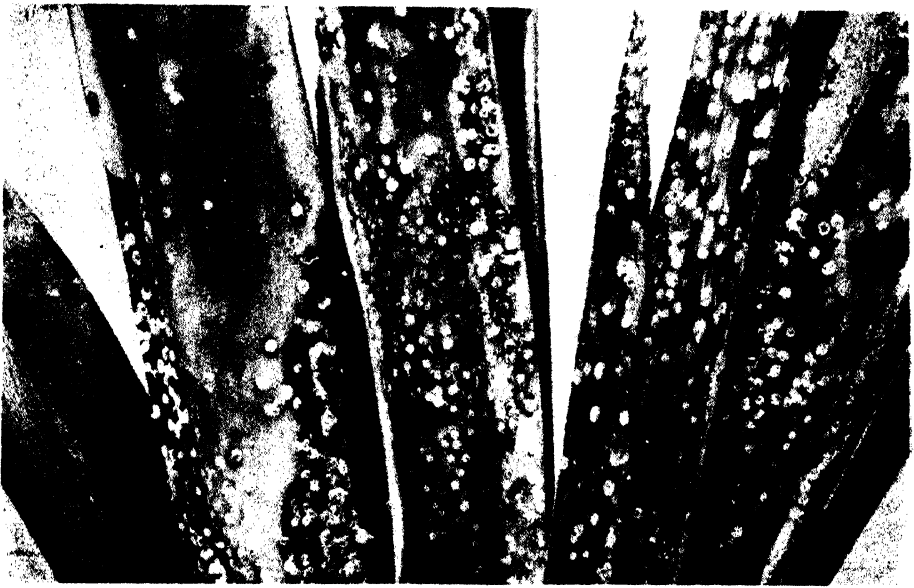


Plate 9.

SCALE-INFESTED LEAVES OF PINEAPPLE PLANT.

All the infested crops involved in the recent outbreak were four or more years old and showed obvious signs of declining vigour, even in areas where the scale population was negligible. Conditions were, therefore, favourable for the pineapple scale, and the severity of the attack indicated that the pest had been in the district for some years. In spite of this, surveys in the Rochedale and adjacent districts failed to widen the known infested area beyond the few adjoining properties on which it was first discovered. It must be inferred, therefore, that natural dispersal is very slow. Infested planting material would, of course, rapidly distribute the insect, but Rochedale is more or less isolated from the more important pineapple-producing areas and is not a source of planting material for outside districts.

Control.

Though the scale is well known in most countries where its host plant is grown at all extensively, control measures apparently receive little attention, and it must be presumed, therefore, that the pest is seldom an important factor limiting production. This is perhaps not surprising, for the cultural standards required from growers of canning quality pines are exacting in respect to both the careful selection of planting material and the management of the crop on a three-crop cycle basis. Planting material is usually drawn from the off-shoots of parent plants under two years old, and these are unlikely to harbour the scale unless they themselves were infested when planted out in the field. Even if circumstances compelled a grower to use inferior planting material, it is improbable that young plants carrying so conspicuous an insect would escape detection and subsequent elimination. Similarly, the short-term rotation used by Smooth Cayenne growers is unfavourable to the pest, for the cropping period normally allows insufficient time for an insect of this kind to increase to troublesome proportions. Quite apart from the handicaps imposed on the insect by cultural practices, natural controls can also be important. Perhaps the most striking of these is a small wasp parasite (Plate 10), which occasionally destroys large numbers of the scales.

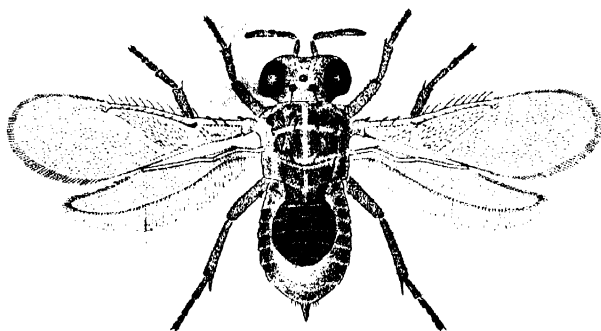


Plate 10.

WASP PARASITE OF THE PINEAPPLE SCALE $\times 30$.

[Drawing by William Manley.]

The pineapple scale is easily killed by summer white oil emulsions when the infested parts of the plant can be thoroughly sprayed. Field treatment is, however, not particularly effective owing principally to the fact that many of the scales are located in sheltered parts of the plant which cannot be reached with ordinary spray equipment. Hence, a considerable number survive treatment and provide a nucleus from which the pest may again increase to pest proportions in a comparatively short time. Precautions must, therefore, be taken to prevent the introduction of the pest to uninfested plantations, and the most obvious method is to use only clean planting material. The amount of planting material required for the establishment of a commercial area is considerable, and pre-planting treatments, such as fumigation, which might destroy any scales present, could only be applied in an emergency. However, there is little risk of introducing the pest if the farmer draws his supplies from areas where the scale has not been seen, particularly if the planting material is taken from two-year-old stands which have just completed bearing their first crop of fruit.

If, in spite of this precaution, the scale does appear on a plantation, it will usually be confined to a relatively small area for some time. Eradication may then be attempted by digging up and burning any plants which show the slightest sign of infestation and then spraying plants in a marginal strip round the area with a white oil emulsion at a concentration of one in forty.

Lichens in Citrus Orchards.

F. W. BLACKFORD, Assistant Research Officer.

LICHENS belong to a very lowly form of plant life consisting of a fungus and an alga living together in close association. They are of very frequent occurrence in the wet, coastal districts of Queensland, and, in a citrus orchard, are usually found on the trunks and larger branches of old or neglected trees as grey, paper-thin growths (Plate 11) pressed close to the bark or as greyish-green, branched, thread-like tufts standing out from the bark (Plate 12).

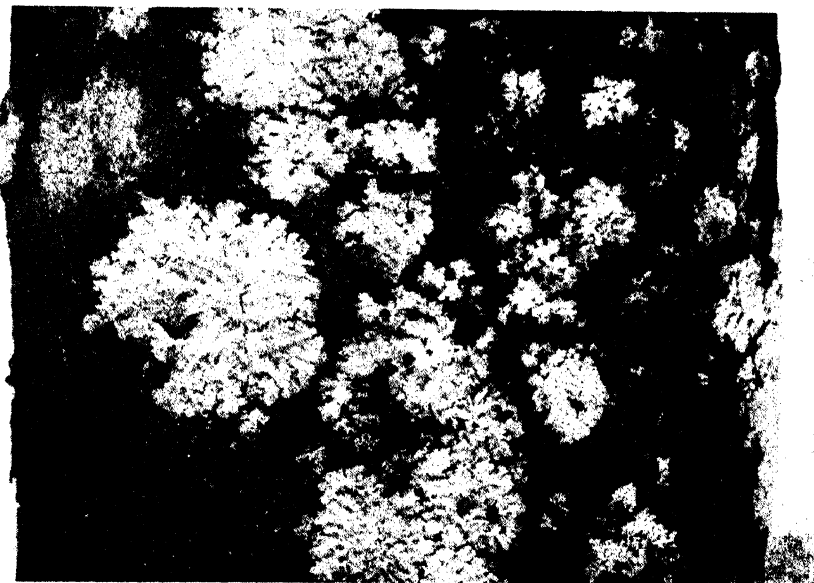


Plate 11.

LICHENS GROWING ON BARK OF CITRUS TREE.

Although many orchardists believe that lichens are harmful to the citrus trees on which they occur, such is not the case. Rather does their presence indicate that the infested trees are in an unhealthy or neglected condition, and actually their food is obtained from the air and any decaying material which may collect in crevices and cracks in the bark. The trees merely serve as a base on which this peculiar plant association may grow; quite commonly old wooden fence posts may be found performing the same function for the lichens.

Control.

Usually no special measures need be applied to control the growth of lichens. The 1 in 15 lime sulphur spray applied in late winter for

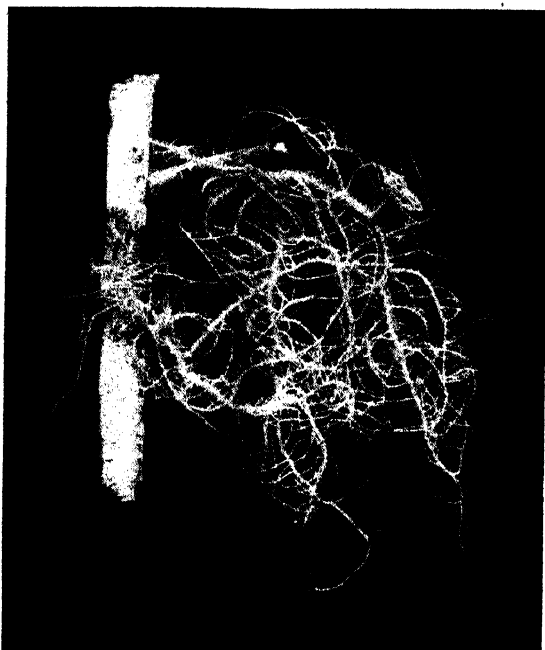


Plate 12.
MUCH-BRANCHED LICHEN GROWING ON CITRUS TWIG.

the control of white louse, Maori mite and bud mite, and the cuprous oxide mixture applied at other times for disease control both check the development of lichens. Therefore, if lichens appear to any extent in a citrus orchard, either of these sprays, regularly applied at the time recommended for its usual purpose, will restrict and finally eradicate lichenous growth. Appropriate measures for the improvement of the health of the trees should also be taken to hasten the disappearance of the lichens.

Mealy Bugs.

W. A. SMITH, Assistant to Research Officer.

THE group of scale insects known as mealy bugs* comprises a number of species which attack cultivated plants. They are small, oval in outline, covered with a white mealy powder, and possess waxy filaments protruding from the sides of the body. The adult females are rarely more than a-quarter of an inch in length and have no wings. The male is quite different in appearance, being an inconspicuous, winged insect with two long filaments of wax projecting from the abdomen.

Habits and Life History.

Mealy bugs feed by inserting their piercing mouth parts into the tissues of the fruits, leaves, stems, or roots of their host plants and extracting the sap. The damage done to an infested plant is not great, but the associated sooty moulds, which mar the appearance of the host plant and frequently blemish its fruit, are very objectionable. Garden plants subject to infestation include poinsettias, crotons, ferns, and

* *Pseudococcus adonidum* L., *Ferrisia virgata* Ckll. and related insects.

orchids; gladioli bulbs may also be attacked. Custard apples (Plate 13), grapes (Plate 14), citrus, pineapples, passion fruit, grasses, such as paspalum, and even weeds, such as nut grass and mint weed, may often be the host plants of mealy bugs.

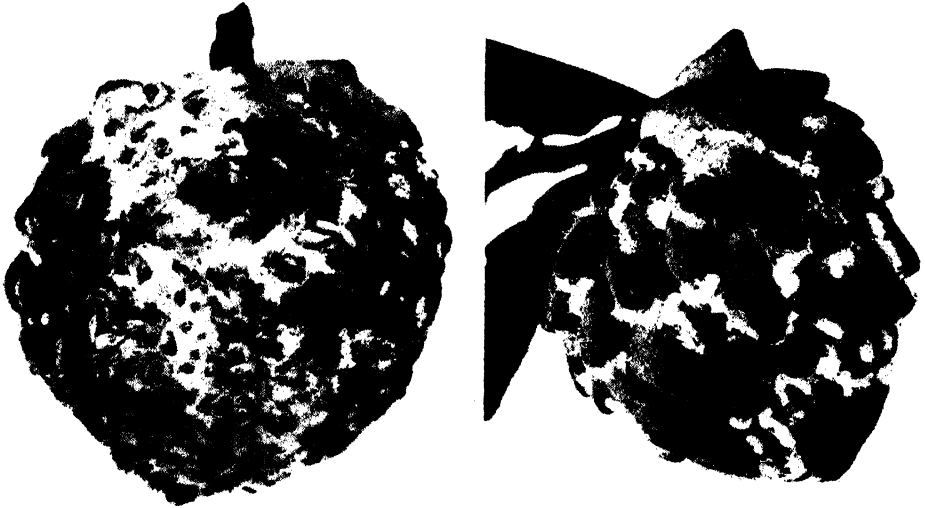


Plate 13.

CUSTARD APPLE FRUITS INFESTED BY MEALY BUGS.

These insects secrete a sugary solution known as honey dew, and this is attractive to ants, which frequently carry the mealy bugs about on the plant or from plant to plant in much the same way as they do aphids. New colonies may be established by the ants in crevices on the plant or in any available sheltered place of a similar nature, though the insects also establish new colonies independently of the ants. Eggs develop within the body of the female and hatch only after the death of the parent insect. The young larvae, though somewhat similar in structure to the adult females, are much smaller and have the mealy covering and wax filaments less well developed. Mealy bugs grow rather slowly, and there are seldom more than three complete generations each year.

Control.

Normally, a ladybird beetle*, which is steely-blue in colour with brown-tipped wing cases, is active during outbreaks of mealy bugs. The larvae of this beneficial insect also feed on the mealy bugs and, being similar in appearance, are frequently mistaken for them. Although they are also covered with meal and wax, they are flatter and much more active than the insects on which they feed and can thereby be distinguished from them. Another and larger insect enemy of mealy bugs is the larva of a lacewing. This predator can be identified by the fact that its larva usually carries scraps of scales and other fragments on its back and by the presence of distinct sickle-shaped jaws.

In spite of the beneficial activities of these two predatory insects, control measures are sometimes required for mealy bugs. On garden plants, many of which are susceptible to spray injury, a spray containing 1 oz. of nicotine sulphate, 3 oz. of soft soap, and 4 gallons of water

* *Cryptolaemus montrouzieri* Muls.

can be safely used. Two or more treatments at short intervals will usually be necessary to establish control. Stored bulbs are liable to become infested, and these should be immersed in a bath containing 2 oz. of white oil, 1 oz. of nicotine sulphate, and 4 gallons of water for at least thirty-six hours and then dried in the sun.



Plate 14.

GRAPES INFESTED BY MEALY BUGS AND BLEMISHED WITH SOOTY MOULDS.

Custard apples and grapes, the two fruits on which mealy bugs can become a major problem owing to contamination of the fruit at harvesting, may require to be sprayed. If mealy bugs are apparent when the fruit is beginning to set, a spray containing 1 quart of white oil, 1 pint of nicotine sulphate, and 80 gallons of water can be applied. Later in the season, when the fruit is maturing, any contaminated fruit should be treated with a derris spray at the strength recommended by the manufacturers. Spot spraying is usually all that is necessary at this stage. These sprays should, where possible, be applied when the young are hatching.

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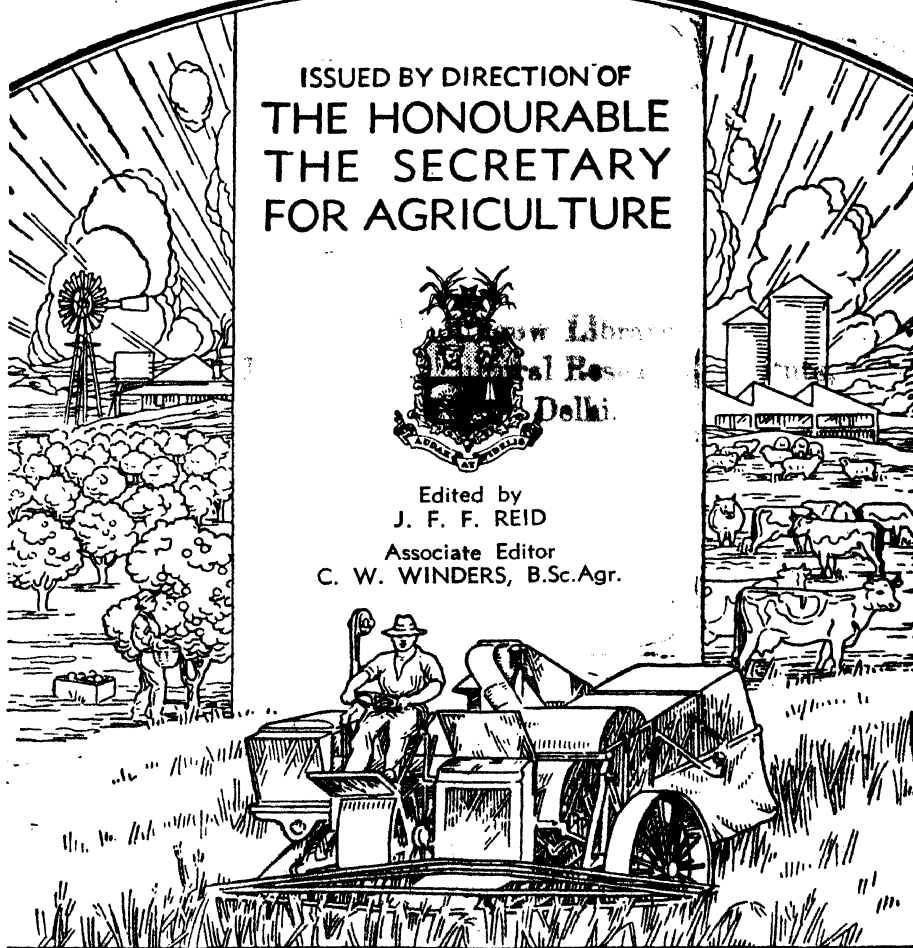
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Pineapples in North Queensland	332-340	Mealy Bugs	30-32
When Water is Limited	79	STEPHENS, S. E.—	
HASKLER, E. R.—		Vegetable-growing in North Queensland	19-25, 147-153, 214-216
Broom Millet	197-201	SUTHERLAND, A. K. and R. REIK—	
HODGE, J. L.—		Phenothiazine for Worm Parasites in Horses	60
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Preparation of the Clip for Market	95-97	SYMES, R. E.—	
The Crossbred on the Farm	355-356	Economies in Production	309-311
IRVING, M. R.—		TUMMON, C. R.—	
Contagious Abortion (Brucellosis) of Cattle	114-117	Post-war Planning for Dairy Farms	291-294
JARVIS, H.—		The Sediment Test for Milk	230-231
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JESSER, L. R.—		The Head of the Herd	231
Marketing Eggs	174-178	WEDDELL, J. A.—	
KERR, J. A.—		Fruit-sucking Moths	89-92
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MCKEON, C. J.—		WELLS, W. G.—	
Grain Sorghums	325-327	A Review of the 1943-44 Cotton-growing Season	264-267
Growing Maize for Grain	5-14	Crop Rotations for Farms in Cotton Districts	76-78
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Fowl Pox	312-314	Crotan Weed	343
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PARK, W. J.—		WHITE, M.—	
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Dairy Premises.

E. B. RICE, Director of Dairying.

(Continued from p. 376, June, 1944.)

Shed and Dairy Layouts for Machine-milking.

(a) *Detached Shed and Dairy.*—Any type of shed referred to may be built in accordance with the preference of the individual. However, irrespective of shed design, the Regulations insist upon the following requirements in the dairy section of any shed intended for use with a

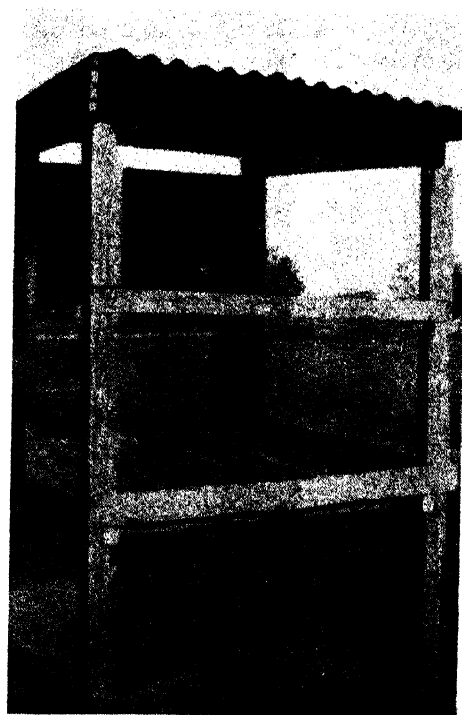


Plate 15.
COVERED MILK STAND.

milking machine:—(a) A 6-feet walled air space between the first bail and the separating or milk-cooling room; (b) The engine and vacuum pump to be housed outside the separating-room; (c) the milk or cream to be stored and washing-up and storage of utensils to be done 30 feet away from the cowyard. The air passage may be, and usually is, used to house the engine and vacuum pump. Protection of the engine from inclement weather is secured by placing louvres on the outside (shed exit end) end of the air passage. A typical layout is shown in Plate 16.

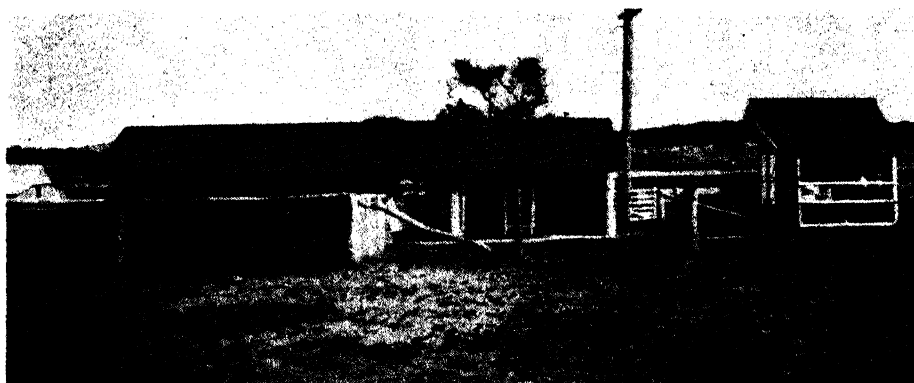


Plate 16.

MILKING BAILS AND DETACHED DAIRY HOUSE "A."—Electricity is used to drive the milking machine on this farm.

(b) *Combined Dairy Building.*—With the increasing use on dairy farms of milking machines, steam sterilisers, and mechanical cooling, certain disadvantages were associated with a division of dairying operations, and so to replace detached buildings, a building was planned

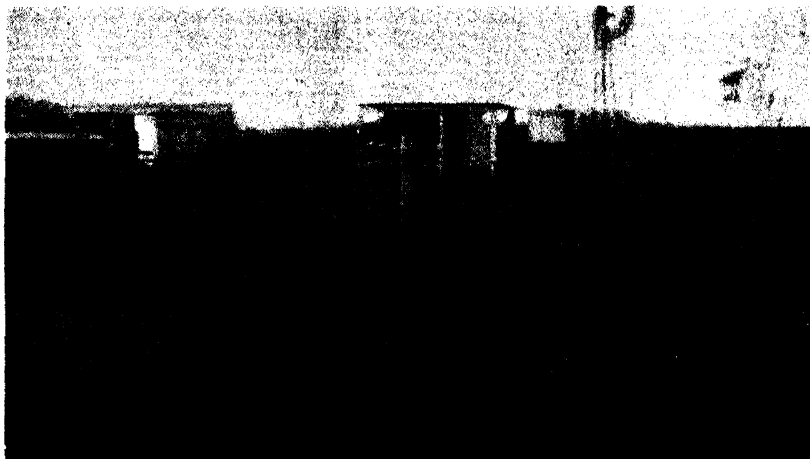


Plate 17.

LAYOUT OF DAIRY BUILDINGS ON A SMALL FARM WHERE ALL OPERATIONS, EXCEPT MILKING, ARE CARRIED OUT IN THE DETACHED DAIRY.—Note the Dairy House "B," covered milk stand, and galley for boiling water all combined in one building.



Plate 18.

LOUVRED ROADSIDE CREAM SHELTER.

in which all work could be done under a single roof. The main features of the combined dairy building (see Q.A.J., Jan., 1941), are:—

1. The dairy section of the building—consisting of (a) engine-room (and air-passage), (b) separator and milk cooling room, (c) milk or cream storage stand, and (d) wash-up room—is attached to and under the same roof as the bails.



Plate 19.

A GENERAL VIEW OF A COMBINED DAIRY BUILDING AND IMMEDIATE ENVIRONMENT.—
Note side assembly yard.

2. Concreted areas at the entrance to and exit from the bails up to a distance of 30 feet from the dairy section of the shed provide a clean approach for stock, and reduce dust and shed odours in the vicinity of the dairy section.

3. A stock-proof enclosure extending 30 feet in each direction.



Plate 20.

A CLOSE VIEW OF THE SHED, SHOWING EXIT RACE AND LOUVRES IN ENGINE-ROOM.

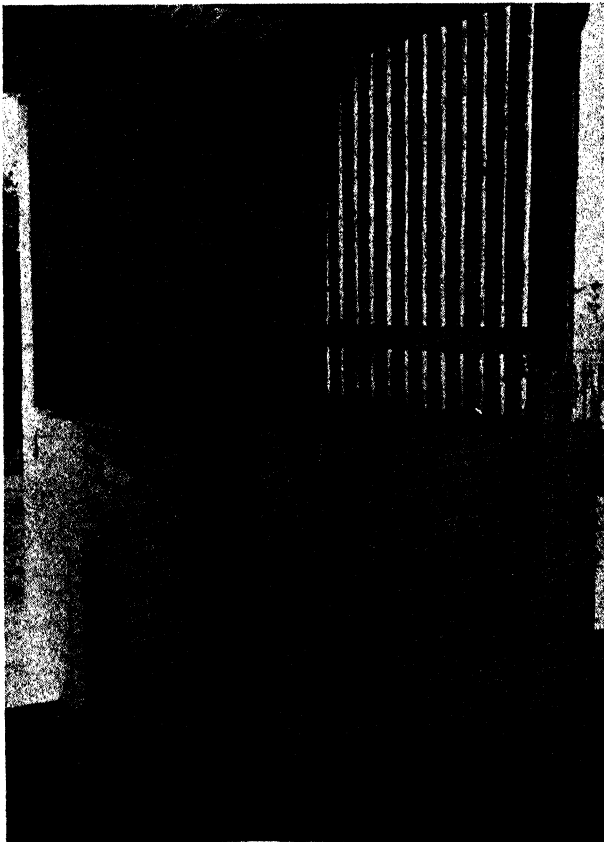


Plate 21.

A CONVENIENT BUILT-IN BOILER ON A DAIRY FARM; RACKS FOR UTENSILS ARE NEARBY.

Full information in regard to this building is obtainable in the bulletin "A Dairy Building Plan."

Shed and Dairy Equipment.

The necessary equipment for dairy sheds is itemised below:—

- (1) Abundant water supply.
- (2) Adequate hot water or steam supply. The minimum is a 12 gallon set-in boiler, within 15 feet of the shed, while steam sterilisation is compulsory in a shed operating a milking machine.
- (3) A wash-up trough, 34 inches long by 20 inches wide by 11 inches deep, fitted with a draining plug.
- (4) Draining rack of galvanised iron piping, or approved material, 16 inches wide and long enough to hold all utensils.

Sundry Items.

General.—Milk vat, buckets or dishes for udder wash water, udder cloths, milk buckets, wash-up brushes, flyproof covers for milk or cream

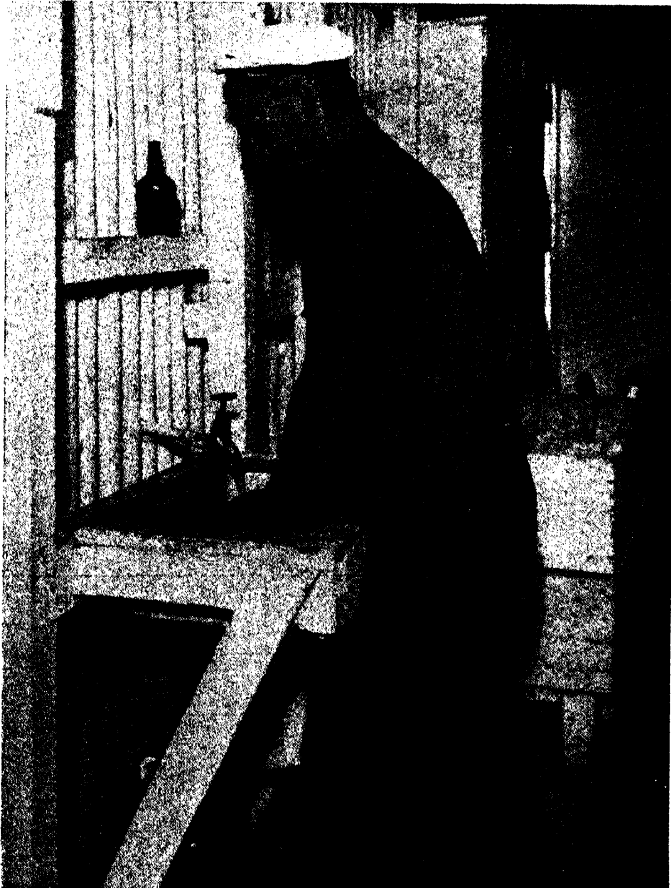


Plate 22.

A CONVENIENT SINK WITH RUNNING WATER PROVIDED IN THE COWSHED FOR THE USE OF MILKERS.

cans, broom, shovel, hosepipe, limewashing equipment, cleansers, first-aid chest, containing needle and syringe, milk fever outfit, two thermometers, drenches, poison antidotes, and pamphlets dealing with common ailments of dairy cattle.

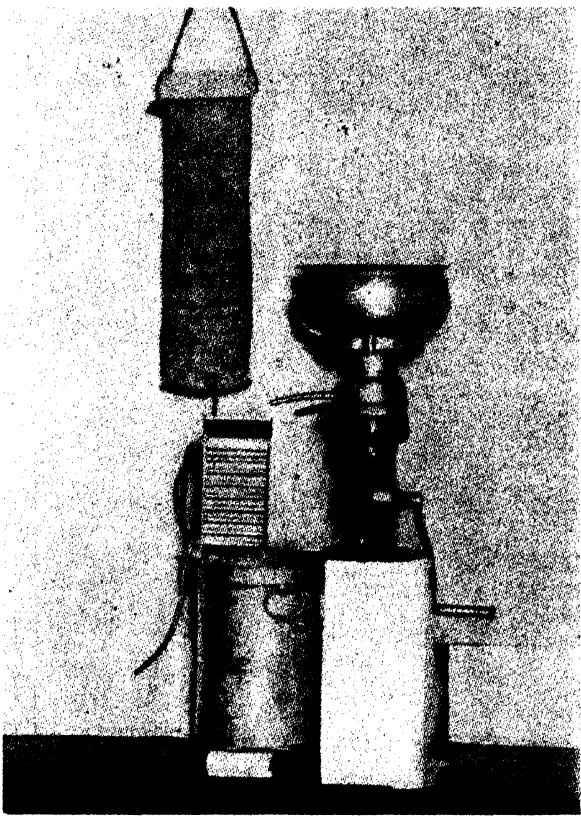


Plate 23.
AN INEXPENSIVE CREAM COOLER.

TABLE OF DISTANCES.

Place, &c.	Distance from Dairy.	Distance from Milking Shed.
	Feet.	Feet.
Dairy house	30	30
Milking shed	50	80
Residence	30	50
Stock	100	150
Stables	50	50
Sanitary convenience (except septic system) ..	50	100
Calves, calf pen	150	150
Fowlhouse	30	30
Manure		
Pigs or piggery		
Trap drain		

For Cream Farms.—Separator, cream cans, strainer (fine mesh), cream stirrer, cream cooler, cool cabinet or concrete trough for holding cooled cream.

For Milk Farms.—Milk cooler or aerator, strainer (use 20-mesh gauze), cotton-wool filter discs, milk cans.

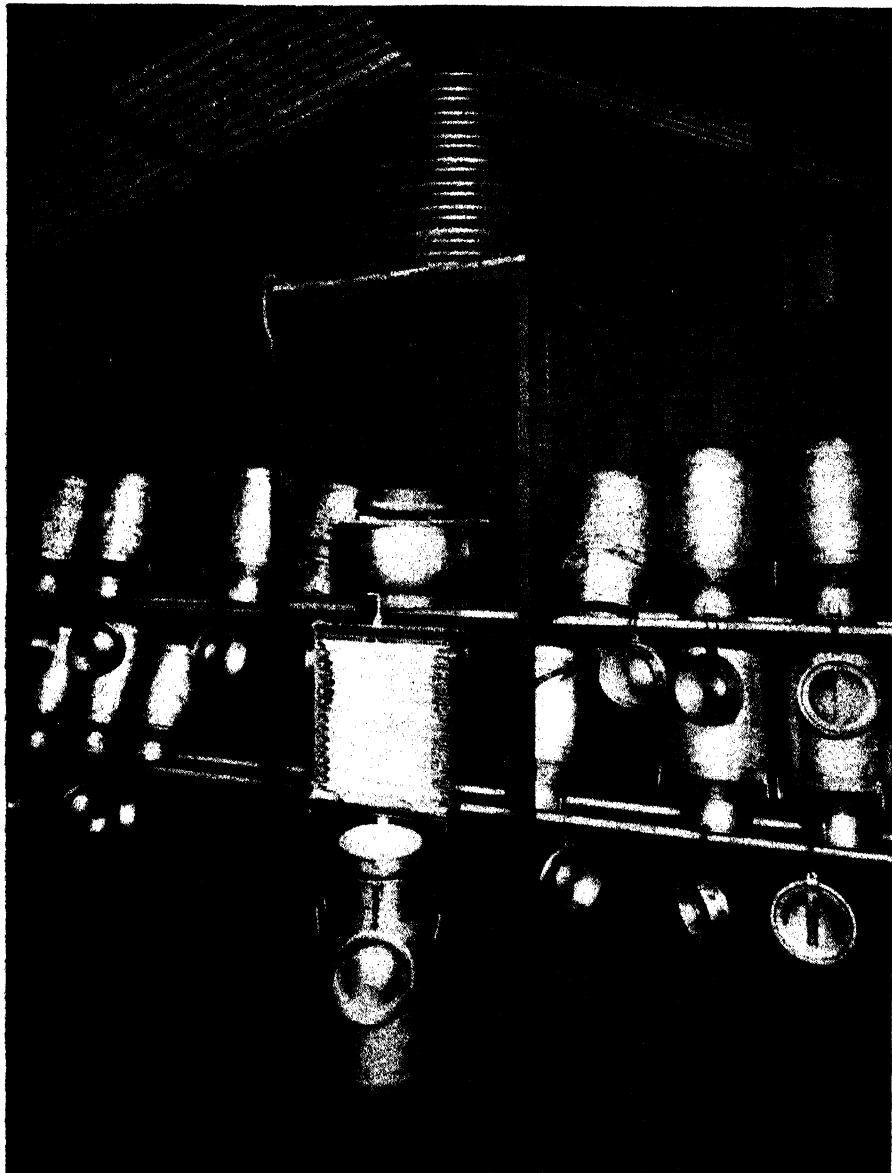


Plate 24.

MILK COOLER, USING WATER STORED IN AN UNDERGROUND TANK ADJOINING THE MILKING SHED.—The water is pumped from the underground tank to the small tank in the shed just before milk-cooling commences.

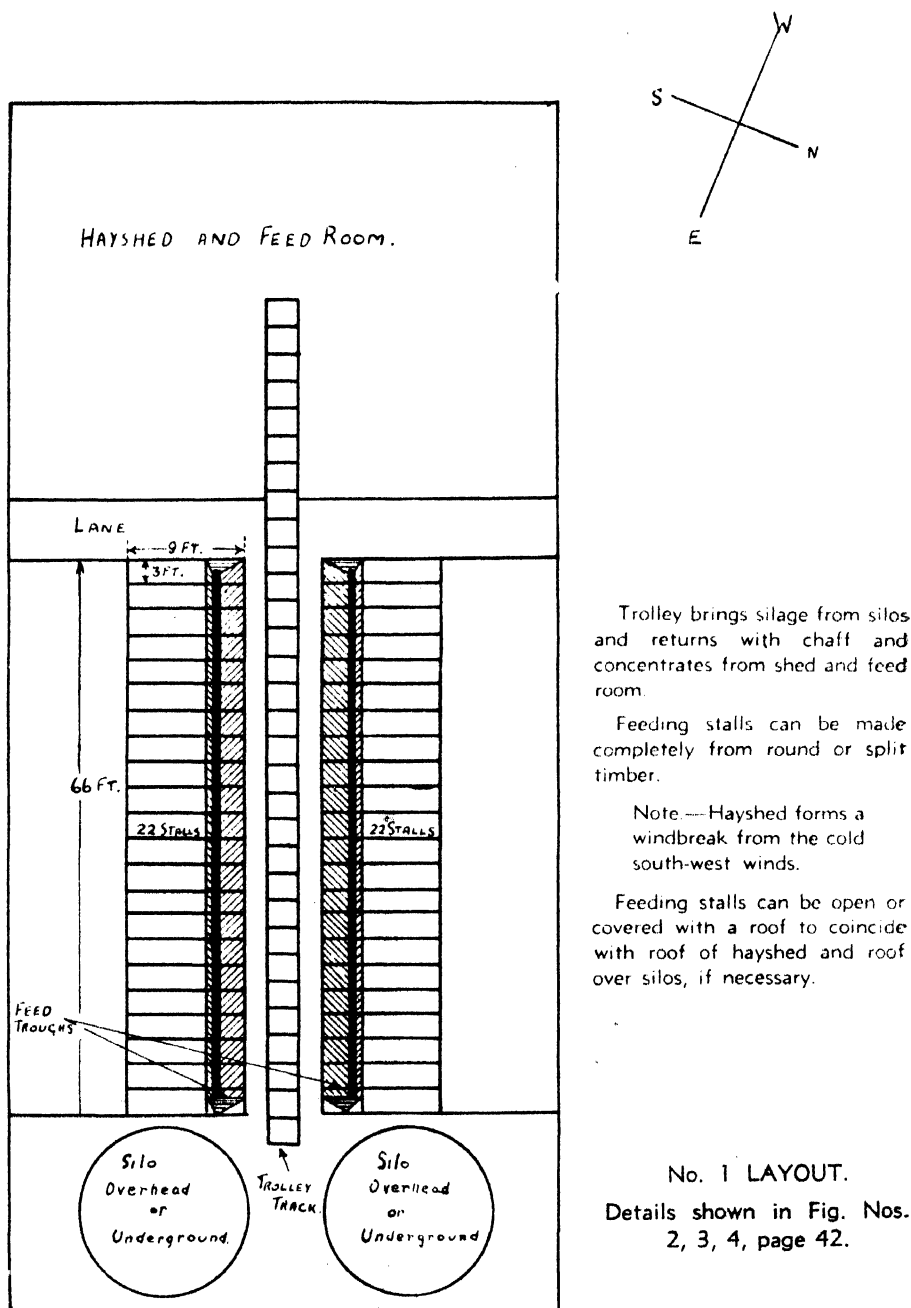


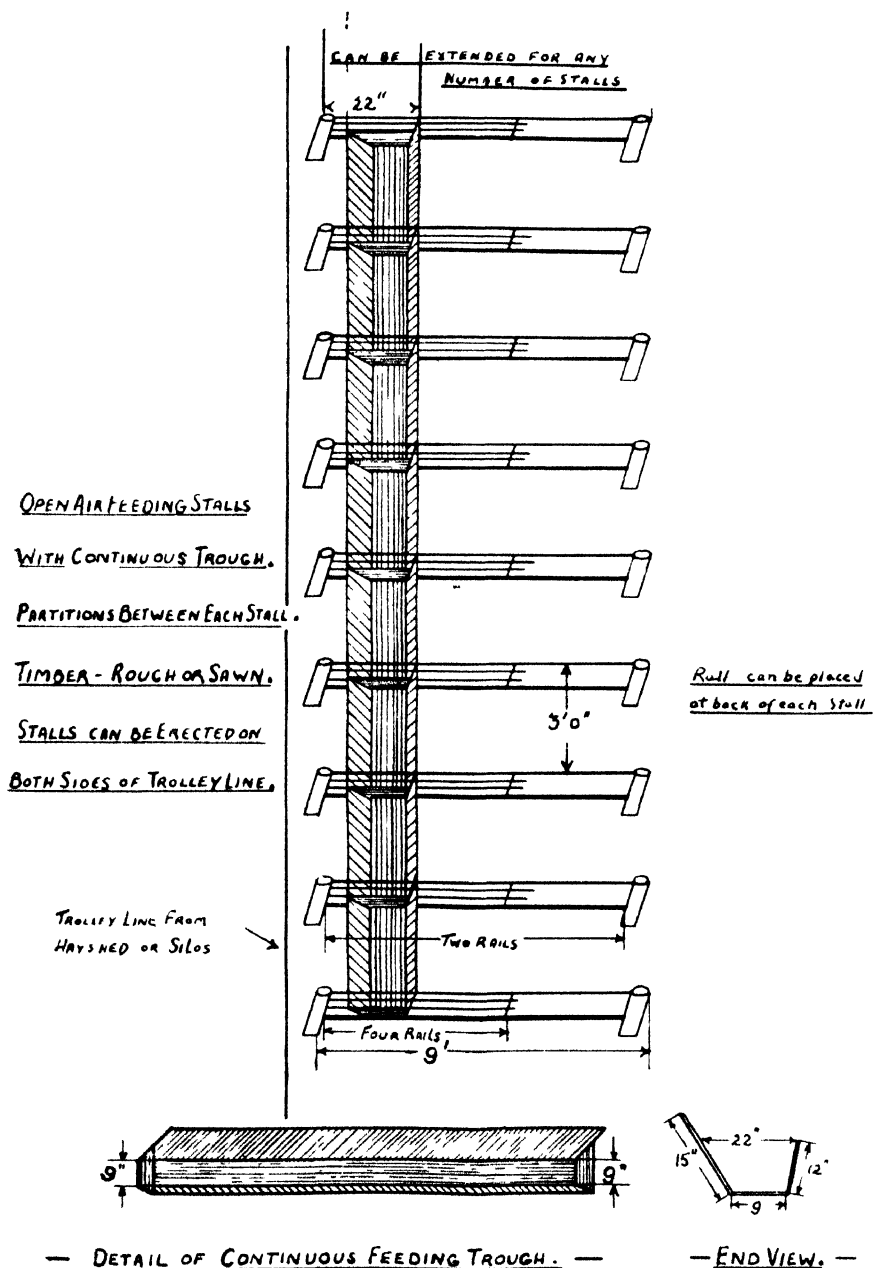
Fig. No. 1.

Plate 25.

FODDER RESERVES AND FEEDING STALLS COMBINED.

Subsidiary Dairy Farm Buildings and Adjuncts.

Feeding Stalls.—Although hand-feeding is at present almost confined to stud farms and farms supplying the liquid milk market



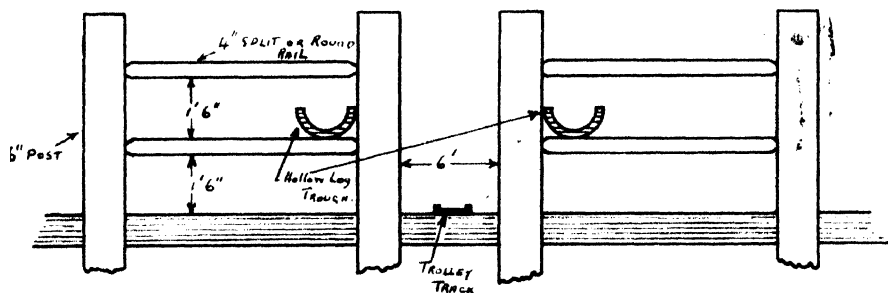
NO 2 LAYOUT WITH DETAILS.

Plate 26.

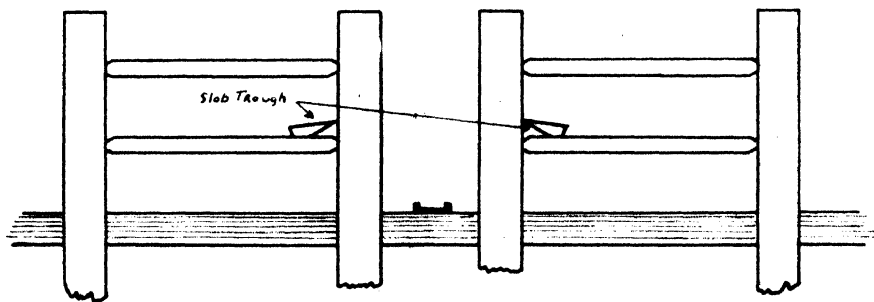
OPEN-AIR FEEDING STALLS ON A DOWNS FARM.

the practice may be expected to extend as dairying becomes more intensive. For the guidance of anyone contemplating the installation of feeding bails, three typical Queensland designs are shown in Plates 25, 26, 27, and 28.

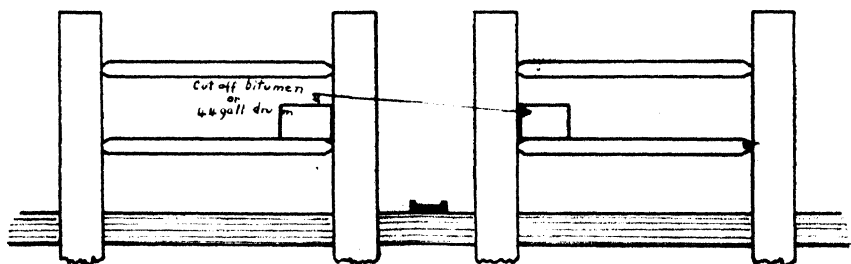
Calf Paddock and Feeding Bails.—Special provision for housing and care of calves is too often lacking on dairy farms. Certainly in the Queensland climate calves are better kept out in the open, but some shelter is desirable for very young calves. All that is needed is a shed closed on three sides, open to the north, with a clean, dry floor. Only



— FIG No 2 - SIDE VIEW OF STALL SHOWING HOLLOW LOG TROUGH. —



— FIG No 3 - SIDE VIEW SHOWING SLAB TROUGH. —



— FIG No 4 - SIDE VIEW SHOWING TROUGH OF CUT OFF BITUMEN OR 4 1/2 GALL. DRUM. —

Plate 27.

DETAILS OF STALLS AND TROUGHS FOR NO. 1 LAYOUT.

a small run is required for recently dropped calves. They can soon be removed to a larger calf paddock, which should have good pasture, be well drained, and provide shelter from excessive heat and cold winter winds by means of a belt of trees or hedges along the western and southern fences. Calf-feeding bails—the open-air kind are sanitary and suitable—ensure ease in feeding, avoid spillage of the skim milk, give the weaker and slower-eating calves the opportunity for their fair share, prevent calves sucking each other, and make them easier to handle. By leaving the calf in the bail for about 20-30 minutes after feeding the inclination to suck others is curbed.

NO.3 LAYOUT WITH DETAILS.

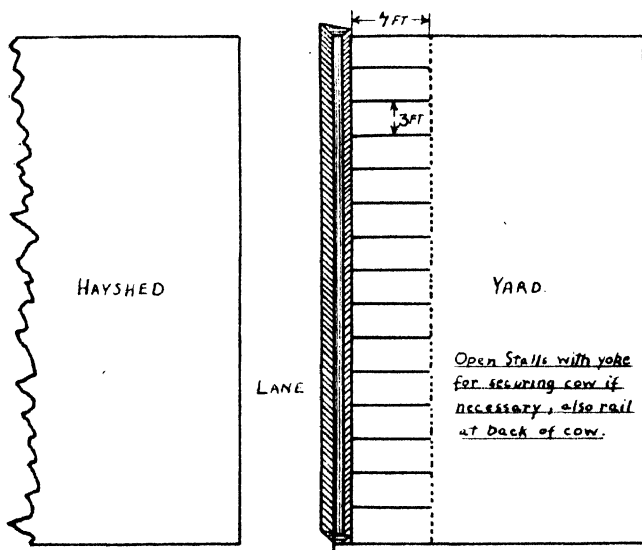


FIG NO.1 - LAYOUT OF FEEDING STALLS SIMILAR TO THOSE ON A PROPERTY ON THE DARLING DOWNS.

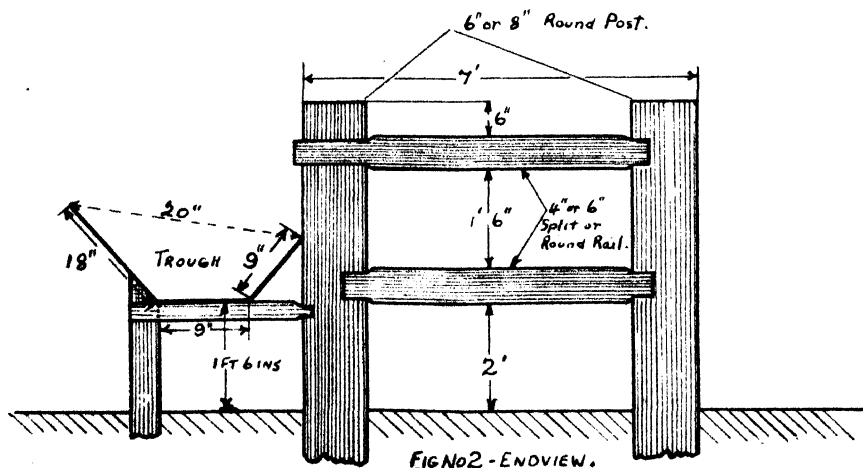
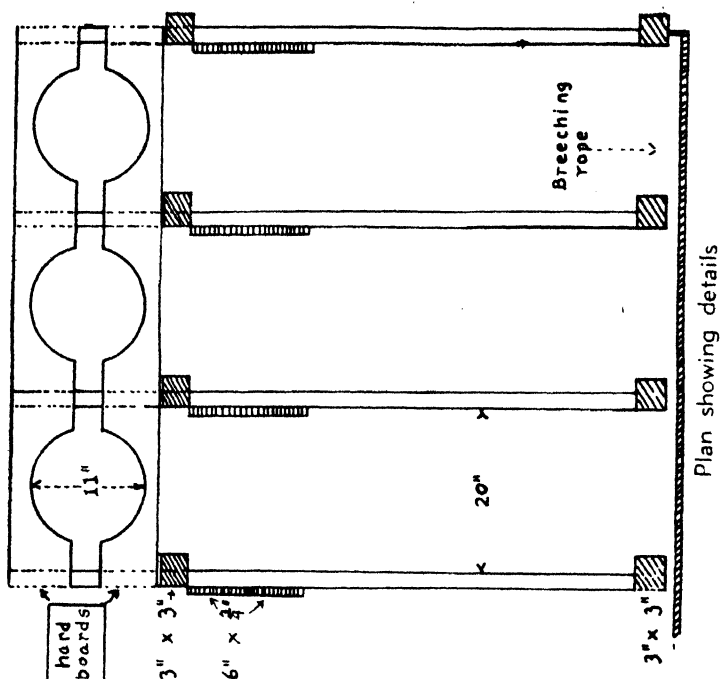


FIG NO.2 - ENDVIEW.

Plate 28.

A THIRD TYPE OF FEEDING STALLS.



CALF PENS

Showing side elevation and ground plan, also sketch of calf paddock and holding yard.

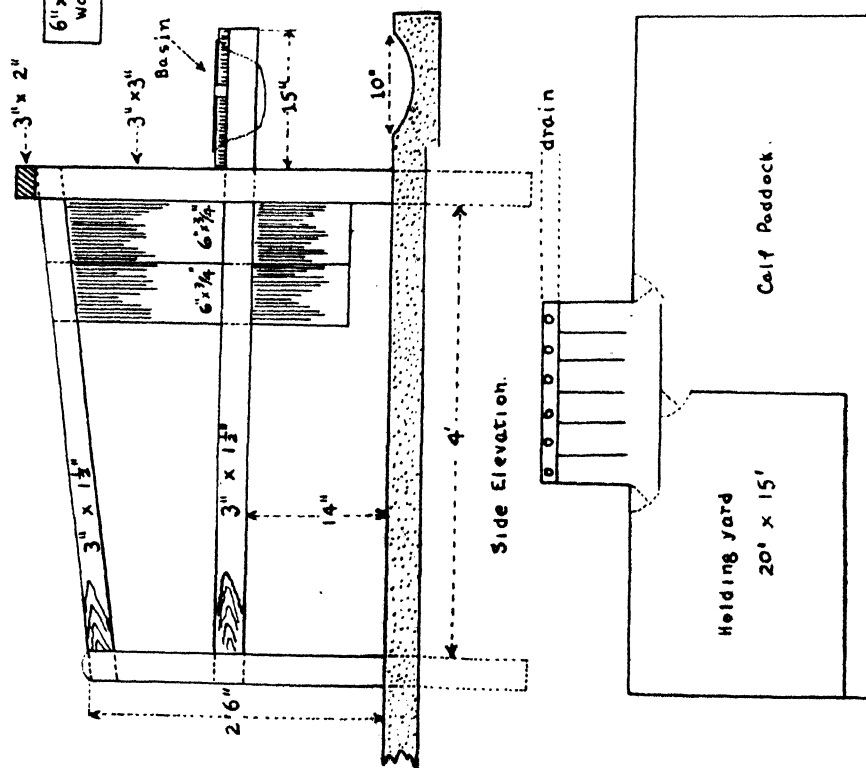


Plate 29.

Isolation Paddock.—An isolation paddock, although usually conspicuous by its absence, should be provided on every dairy farm. How many diseases could be checked if a farmer had a good isolation paddock in which he could place and watch a suspected animal, without any danger of the animal coming into contact with the rest of the herd?

Crush.—Apart from milking, any operation performed on dairy cows in the bails invariably upsets them, making them nervous while in the bails for some days afterwards. Consequently, they often acquire the habit of soiling the floors. A crush should be used for all operations on dairy stock, except milking; for example, the handling of bulls and young stock, testing for tuberculosis, inoculating, and so on.

Implement Shed.—Protection of valuable farm machinery and implements from the weather should be ensured. All that is required is a roof. It is advisable to have strong supporting posts, which should be as few as possible in order to give the least interference in the moving of implements.

Silo.—The necessity for the conservation of fodder, especially silage, in order to carry the dairy herd over periods of pasture scarcity or drought, is being increasingly appreciated. The silo should be handy to the cow shed. The special departmental bulletin, entitled "Fodder Conservation," should be consulted on this subject.



Plate 30.

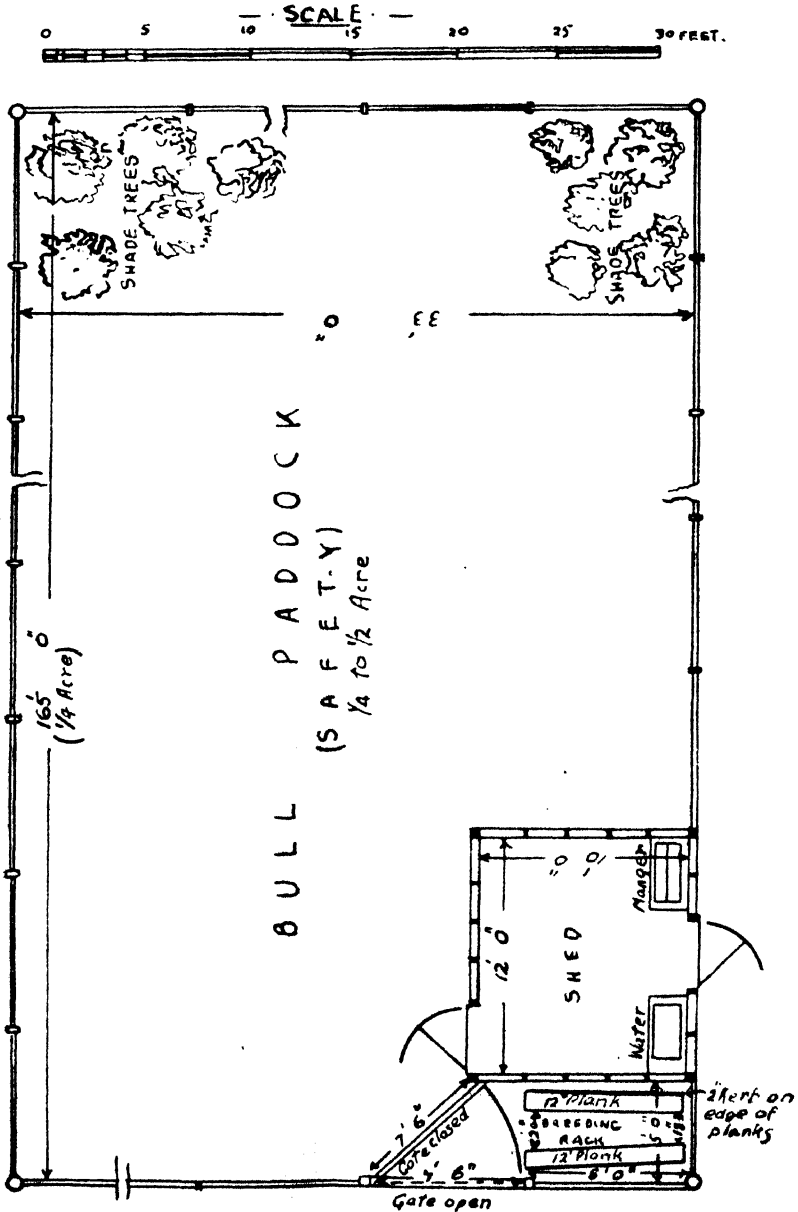
TREES PLANTED TO PROVIDE SHELTER AND SHADE FOR COWS ADJACENT TO THE COWYARD.

Shade and Shelter.—Protection of dairy stock from the discomfort of excessive heat or cold should receive consideration on every dairy farm. Belts of trees or scrub are eminently suitable. The planting of trees or shrubs adapted to rapid growth in the particular district in which the farm is situated will provide breakwinds along portions of the westerly and southerly fences.

Bull Paddock.—On Queensland farms, the bull is usually allowed to roam freely with the herd. The disadvantages of this system are:—(a) records of dates of service cannot be kept; (b) "freshening" cannot be controlled; (c) the bull's services are needlessly wasted; (d) disease may be spread by the bull; (e) there is always a risk of the

bull attacking some person. The special care which a good bull warrants can only be properly given if he is kept apart from the herd. Plate 31 illustrates a safety bull paddock widely used in Western

BULL PADDOCK.
(SAFETY)



PLAN
Plate 31.

A PLAN OF A SAFETY BULL PADDOCK.

Australia. Acknowledgment is made to the West Australian Department of Agriculture for permission to reproduce it in this Journal.

Conclusion.

A prudent course for any farmer to follow before commencing any buildings, making alterations, or installing equipment is to contact the nearest dairy officer, who will willingly give any advice or information. This would avoid any possibility of buildings having to be altered because of failure to comply with the Act. Moreover, the dairy officer can often suggest ways and means of economising in expenditure by building the premises in a certain manner.

Plans and specifications of the buildings referred to in this paper are obtainable, free of cost, upon enquiry from the Department.

WATERPROOF WHITEWASH.

A waterproof whitewash which has been used extensively on Bukura Agricultural Station, Kenya, for external work and has withstood our high rainfall and even severe hail, where the plaster is hard enough to resist pitting, is made up as follows:—

- (a) Unslaked lime or lime oxide, 7½ lb.
- (b) Rock salt or cattle salt, 1½ lb.
- (c) Cement, ¾ lb.

The method of preparation is:—Dissolve the salt in 1 gallon of cold water. When completely dissolved pour on to the lime. Now add to the lime 1½ gallons of water, *slowly* allowing it to slake. Add the cement by sprinkling on a little at a time when the lime is almost slaked. Stir thoroughly. It is advisable to use a trough-like receptacle for the preparation of this limewash, because terrific heat is generated during the slaking of the lime. The use of a narrow-mouthed mixing vessel can very easily result in a mild explosion caused by the steam, with probable serious burns to the operators.

It is highly important that, as soon as the lime has slaked, the wash should be applied *immediately and while still hot*. That is why the above proportions have been given as it has been found that one man can supply this volume before the last of it gets cold.

It will be found that the quantity of water given is by no means a constant. It depends on the quality of the lime used, some slaking quickly, some slowly, so that each type generates heat at a different rate. Thus, more or less water is lost as steam according to the quality or type of lime used. Rock forms slake slowly, but the powders are almost instantaneous. The ideal mixture should have the consistency of rather thick distemper. A little water may have to be added to the last gallon or so of mixture. Keep stirring constantly. It pays to have two people on the job, one to stir and prepare the batches of wash and one to apply it.

It is important to see that the surface to receive the whitewash is free of old, flaking lime or other washes. Part of the advantage of this wash is its power to penetrate the plaster, whether the latter is cement or lime. Thus a clean surface will ensure success.

For internal use this whitewash has also been most useful, because it can be washed, even scrubbed without coming off.

Of the many recipes for whitewash, this appears to be the only one, so far tried, that bears out its name and is certainly proof against rain once it has set. It takes about two days to harden sufficiently to withstand heavy rain. For preference, just as with plasterwork, this whitewash should be applied, externally, during dull or misty weather, but it will be found that it will set and not flake even if applied during dry hot weather.

—From an article by M. D. Graham, Agricultural Officer, Department of Agriculture, Kenya, in the EAST AFRICAN AGRICULTURAL JOURNAL for January, 1944.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn, Jersey, and Ayrshire Societies production records for which have been compiled during the month of May, 1944, (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE (STANDARD 350 LB.)				
Model 2nd of Alfa Vale (365 days)	W. H. Thompson, Nanango	16,060.5	783.855	Reward of Fairfield
Queenie 14th of Greyleigh (365 days)	W. H. Thompson, Nanango	16,829.15	632.469	Thornleigh Champagne
Alfa Vale Model 14th	W. H. Thompson, Nanango	11,602.3	526.83	Reward of Fairfield
Alfa Vale Model 9th	W. H. Thompson, Nanango	11,055.05	514.218	Reward of Fairfield
Jamberoo Glory 4th	M. J. Brosnan, Clifton	10,291.65	414.725	Brookland Ter. Banker
JUNIOR, 4 YEARS (STANDARD 310 LB.)				
Sunnyview Locket 2nd	W. Henschell, Yarranlea	9,025.25	366.829	Burradale Byron
College Stately 13th	A. H. S. & College, Lawes	7,564.4	320.667	Dulcamah Disraeli
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Alfa Vale Model 16th	W. H. Thompson, Nanango	12,686.7	605.522	Penrhos Pansy's Pride
Glen Idol Daphne 5th	Estate P. Doherty, Gympie	9,980.9	372.647	Blacklands Count
Ventnor Mab 7th	C. W. Black, Kumbia	8,435.3	342.251	Kyabram Fwinn Boy
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Alfa Vale Floride 4th	W. H. Thompson, Nanango	13,809.25	621.829	Penrhos Pansy's Pride
Alfa Vale Model 17th	W. H. Thompson, Nanango	11,303.6	459.268	Penrhos Pansy's Pride
Jamberoo Birdie 6th	M. J. Brosnan, Clifton	10,953.2	423.544	Greyleigh Vallant
Jamberoo Crummy 5th (258 days)	M. J. Brosnan, Clifton	9,094.	349.88	Greyleigh Vallant
College Molly 8th	A. H. S. & College, Lawes	7,111.05	309.584	Hillview Premier
Tara Flower (206 days)	K. Roche, Sladevale	6,765.16	276.237	Murrays Bridge Pansy's Gift
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Jamberoo Modesty 14th (258 days)	M. J. Brosnan, Clifton	9,160.	345.957	Greyleigh Vallant
Bileena Butterfly 3rd	K. Roche, Sladevale	7,073.	256.715	Tara Governor

	JUNIOR, 2 YEARS (STANDARD 230 LB.)				JERSEY.			
					MATURE (STANDARD 350 LB.)			
Greyleigh Gem 160th	W. H. Thompson, Nanango	..	..	13,377.4				Greyleigh Woodlan
Jamberoo May Flower 10th (254 days)	M. J. Brosnan, Clifton	..	..	8,572.05				Greyleigh Valiant
Trevor Hill Hope	G. Wynne, Umbiram	..	..	6,754.08				Valera Optmist
Happy Valley Warden Belle	R. R. Radel, Coalstoun Lakes	..	..	6,054.77				Sunnyside Warden
Happy Valley Nurse	R. R. Radel, Coalstoun Lakes	..	..	5,373.25				Sunnyside Warden
Bileena Flo 2nd	K. Roche, Slacksdale	..	..	7,054.53				Tara Governor
Burnley Jaunty	A. E. Wilson, Hartstoun	..	..	6,023.65				Calrossie Earl
Romsey Sunflower	D. R. Hutton, Cunningham	..	..	6,966.81			356-751	Retford May's Victor
Treacarne Jersey Queen 5th	T. A. Pethrick, Lockyer	..	..	6,524.85			348-999	Jerseylea Golden Duke
Treacarne Chimes 5th	T. A. Petherick, Lockyer	..	..	6,907.55			341-022	Jerseylea Golden Duke
Westbrook Tulip 101st	A. H. S. & College, Lawes	..	..	6,013.15			318-505	Oxford Astors Lad
Oxford Carolyn	E. Burton and Sons, Wanora	..	..	6,350.6			389-272	Oxford Daffodil's Count
Oxford Frances 2nd	E. Burton and Sons, Wanora	..	..	6,383.85			359-316	Oxford Daffodil's Count
Gem Dolly	W. Bishop, Kenmore	..	..	7,219.3			383-057	Calton Lothean
Boree Butterfly	W. & C. E. Tudor, Branch Creek	..	..	8,200.59			450-371	Maurfield Larkspur's Gift
Oxford Maid Marion	E. Burton and Sons, Wanora	..	..	6,914.7			366-007	Oxford Ajax
Ashview Eva	C. Huey, Sabine	..	..	5,938.6			315-644	Treacarne Butter Queen's Officer
Gem Claudette 2nd	W. Bishop, Kenmore	..	..	6,179.			309-649	Calton Lothean
Ashview Treasure	C. Huey, Sabine	..	..	5,279.55			255-553	Treacarne Butter Queen's Officer
Oxford Mercia	E. Burton and Sons, Wanora	..	..	6,731.05			310-728	Oxford Ajax
Oxford Ginger May	E. Burton and Sons, Wanora	..	..	5,993.8			303-764	Oxford Maid's Victor
Oxford Dixie 2nd	E. Burton and Sons, Wanora	..	..	5,525.65			302-479	Oxford Ajax
Oxford Sandra	E. Burton and Sons, Wanora	..	..	4,680.9			247-877	Oxford Daffodil's Count
Oxford Lila 2nd	E. Burton and Sons, Wanora	..	..	5,067.85			247-861	Oxford Franco
Longlands Nilly	St. Christopher's Stud, Brookfield	..	..	9,211.8			370-717	Longlands Piermont

AYRSHIRE.



Automatic Self-Feeders for Pigs.

E. J. SHELTON, Instructor in Pig Raising.

THE progressive pig breeder is continually on the lookout for equipment which makes herd management more efficient; money expended on such equipment brings a good return by saving time and labour and by permitting more effective handling of stock. Self-feeders which operate automatically, regularly renewing the supply of food for the pigs and protecting it from undue waste—such as from rain, wind, rats, and birds—are worth consideration, especially during war time, when food must be conserved as much as possible.

The feeder consists essentially of a bulk hopper to hold a supply of food and three or more feeding places immediately below into which the food flows; sliding and hinged flaps regulate the amount of food flowing into the feeding place as the food therein is eaten. The hopper should be large enough to hold several days' supply of feed, and the inside walls should be as smooth as possible in order to permit the free and easy flow of food into the trough—some foods, particularly cereal meals, tend to clog, hence this precaution. When it is desired to feed two or more foods separately in the same self-feeder, partitions may be placed in the hopper at any desired positions.

The self-feeder may be adapted to the feeding of any kind of grain, although shelled grain and ground foods are most commonly used. It may be used to feed maize on the cob, but in this case the feeder would be required to be of a larger size than shown in Plates 33 and 34 in order to hold sufficient grain to feed a number of pigs for several days without refilling.

Maizemeal or barley would require a smaller opening to prevent too rapid a flow of grain than would, say, whole maize. It will be noted in the plans that the sliding and hinged flaps have been fitted with thumb screws so as it may be adjusted to suit the type of grain being fed.

One of the most noticeable features about pigs that are accustomed to self-feeders is that there is no over-crowding at the feeders and no evidence of gluttony—only a small quantity of food is consumed at any one time; it is eaten slowly, thoroughly masticated, and there is little or no waste, neither is there any risk of over-eating and serious digestive trouble. It is always advisable to have good pasturage for the pigs during the time they are on self-feeders and irrespective altogether of the system of feeding adopted. It is important that a permanent clean supply of drinking water be available adjacent to the feeders.

Creep Feeder for Young Pigs.

The primary self-feeder is the creep self-feeder. It is used from the time the pigs are about three weeks old until they are able to compete more evenly with their companions at the common food trough. Little pigs that are thus self-fed on an efficient and appetising ration make rapid gains. In some of the litter-record work carried out by departmental officers, self-fed suckers reached the weight of 50-54 lb. at eight weeks of age; this exceeds the average weight of a weaner by 12-14 lb., and, of course, gives the pig that much better start in life.

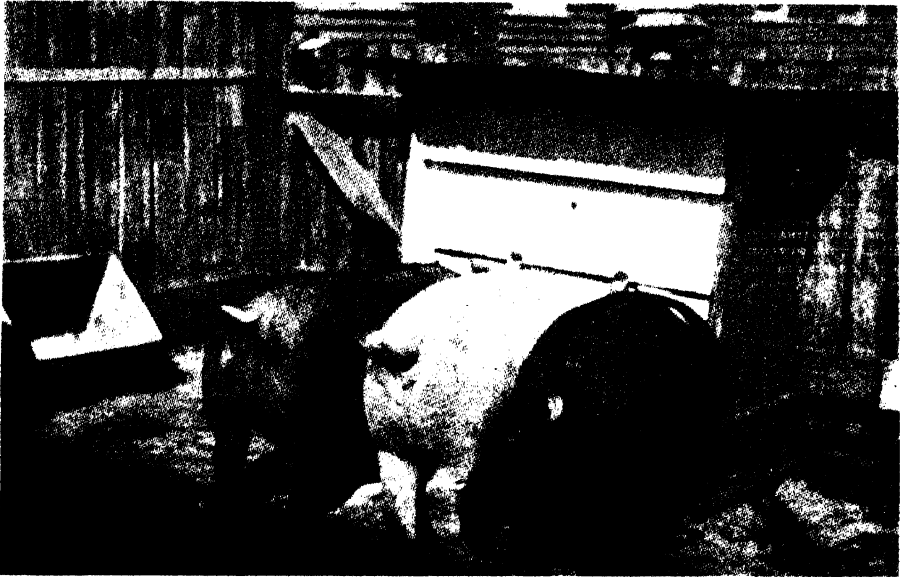


Plate 32.

PIGS AT A ONE WAY SELF FEEDER.

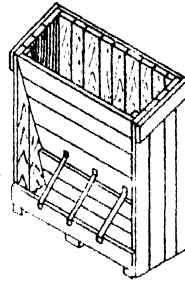
One of the most interesting phases of creep self-feeding is the condition of the sow at weaning time, for, being partly relieved of the strain upon her system, she is in much better heart for future mating than when the litter is entirely dependent upon her milk supply. Young pigs self-fed along these lines do not miss their mother's milk to the same extent when weaning time arrives, and thus they overcome the inevitable check in growth which occurs when there is a complete change from one class of food to another.

Self-feeding of Older Pigs.

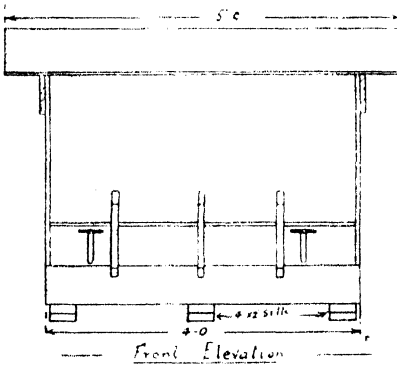
The self-feeding method gives excellent results with growing and fattening pigs, and with old sows—backfatters and choppers—that are being fed to very heavy weights. The self-feeding of old sows for market has a very special advantage, particularly if grain is cheap and the milk supply too limited to allow them to have as much as they can drink. The saving of labour alone in this system is well worth while.

In America the self-feeding of pigs has been developed along "cafeteria" lines, in which different foods are placed in separate compartments of the self-feeder, or in different feeders, and the pigs learn to adjust their requirements and to eat sufficient of the various units to make their feeding profitable.

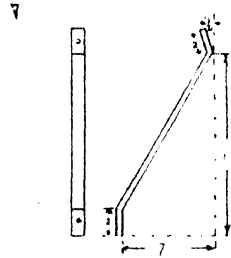
ONE WAY SELF FEEDER FOR PIGS



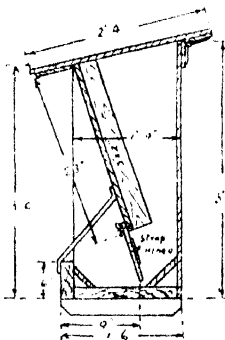
Perspective with Roof Removed



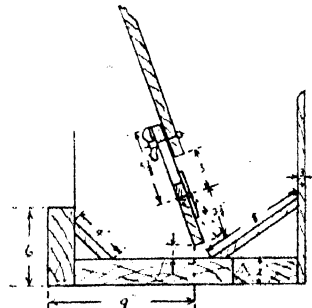
Front Elevation



Detail of Iron Strap



Section

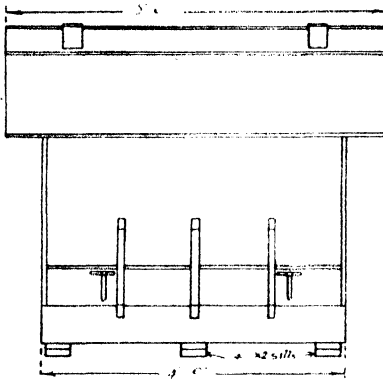


Detail of Slide and Hinged Flap

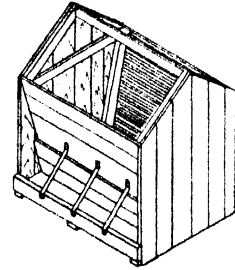
Drawn by J. R. 11

Plate 33.
DETAILS OF ONE WAY SELF FEEDER.

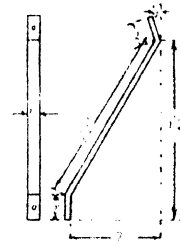
— TWO-WAY SELF FEEDER —
— FOR PIGS —



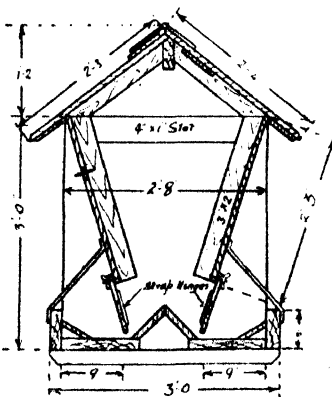
— Front Elevation —



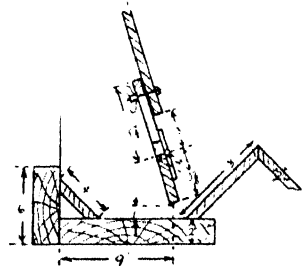
— Perspective with Roof Removed —



— Detail of Iron Strap —



— Section —



— Detail of Slide and Hinged Flap —

Drawn by F. B. 1944

Plate 34.
DETAILS OF TWO-WAY SELF-FEEDER.

The self-feeder should not be used when rapid gains are not required. as, for example, when it is wished to force pigs to make the maximum use of pasture by limiting their allowance of grain, milk, &c.

Farmers feeding with dairy by-products will have no need to feed concentrates such as protein meal or meat meal, for skim milk is very suitable to balance such grains as maize or barley. Of course, the dairy by-products should not be self-fed, for they would soon spoil if more feed is fed than the pigs will clean up at one feeding. Self-feed the grain and hand feed twice daily enough of the skim milk to balance the ration.

According to results of American experiments when feeding pigs without pasture, the following was found to be the average proportions in which to feed milk and grain, and should serve as a guide:—

For pigs just after weaning 4 lb. to 6 lb. of skim milk to each 1 lb. of maize will be found to be sufficient to make the maximum gains. As the pigs grow older the proportion of skim milk may be decreased. Pigs weighing 50 lb. to 100 lb., 3 lb. of skim milk to every 1 lb. of maize, and pigs at 100 lb. to 150 lb. would require from 2 lb. to 2½ lb. of skim milk to every 1 lb. of maize consumed. Pigs on pasture such as lucerne, rape, barley, &c., would need only about half as much skim milk as indicated above. Considerably more milk than previously stated may be fed with good results when a surplus is on hand. Pigs cannot be expected to do much grazing on a crop that is any distance away from the self-feeders. It is in such cases where grazing is intended to form part of the ration that the skids or runners will be found to be an advantage in taking the self-feeder to the crop it is proposed to graze off.



Plate 35.
SHOWING METHOD OF TRANSPORTATION.

Unsuitability for Brood Sows.

Continuous access to self-feeders is not recommended for brood sows. This is because of the tendency of these animals to spend too much time consuming grain or meal and too little time grazing on succulent pasture. The brood sow must be treated in much the same way as the dairy cow, whose milk supply is improved under a system of hand-feeding concentrates, but in both cases the greater portion of the food must be grass or fodder crops as distinct from grain.

Care of Self-feeders.

The two types of self-feeders illustrated should be built on skids or runners to facilitate moving them. If they are strongly constructed, this method of transport will be found simpler and less expensive than carriage on a wagon or slide. It is a distinct advantage to place the self-feeder on a wooden or concrete platform. A well-built feeder should give service for a number of years if painted annually. Self-feeders are, however, not fool-proof. They need regular and constant attention: they need to be kept well filled with grain, in coarse meal form for preference; they need daily inspection, for food may clog in the hopper and the animals may go hungry. After heavy rains or wind, inspection is necessary to see that everything is in order.

Construction.

MATERIAL REQUIRED FOR ONE-WAY SELF-FEEDER.

- Skids*—Three 18 in. lengths of 4 x 2 hardwood.
Trough—One 3 ft. 10½ in. length of 12 x 2 pine;
 One 3 ft. 10½ in. length of 4 x 2 pine;
 One 3 ft. 10½ in. length of 8 x ¾ pine;
 One 3 ft. 10½ in. length of 4 x ¾ pine.
Front Panels—Five 3 ft. 10½ in. lengths of 6 x ¾ T. & G. pine;
 Two 2 ft. 3 in. length of 3 x 2 pine.
Sliding and Hinged Flaps—Two 3 ft. 10½ in. lengths of 4 x ¾ pine.
Ends and Back—Twenty-four 3 ft. 3 in. lengths of 6 x ¾ T. & G. pine;
 One 7 ft. length of 6 x ¾ pine.
Top—Ten 2 ft. 4 in. lengths of 6 x ¾ T. & G. pine;
 Two 5 ft. lengths of 6 x ¾ pine.
Hardware—Three 1 in. x ½ in. iron straps;
 Six 3 in. strap hinges;
 Two 3 in. x ½ in. bolts with thumb nuts;
 Nails, &c.

MATERIAL REQUIRED FOR TWO-WAY SELF-FEEDER.

- Skids*—Three 3 ft. lengths of 4 x 2 hardwood;
Trough—Two 4 ft. lengths of 6 x 2 pine;
 Two 3 ft. 10½ in. lengths of 12 x 2 pine;
 Two 3 ft. 10½ in. lengths of 8 x ¾ pine;
 Two 3 ft. 10½ in. lengths of 4 x ¾ pine.
Panels—Ten 3 ft. 10½ in. lengths of 6 x ¾ T. & G. pine;
 Four 2 ft. 3 in. lengths of 3 x 2 pine.
Sliding and Hinged Flaps—Four 3 ft. 10½ in. lengths of 4 x ¾ pine.
Ends—Twelve 4 ft. 2 in. lengths of 6 x ¾ T. & G. pine.
Frame of Roof—One 4 ft. length of 6 x 2 pine;
 Four 21 in. lengths of 3 x 2 pine;
 Two 2 ft. lengths of 4 x 1 pine.
Roof—Twenty 2 ft. 4 in. lengths of 6 x ¾ T. & G. pine;
 Four 5 ft. lengths of 6 x ¾ pine.
Hardware—Six 1 inch x ½ inch iron straps;
 Eight 3 in. strap hinges;
 Two 5 in. strap hinges;
 Four 3 in. x ½ in. bolts with thumb nuts;
 Nails, &c.

Copies of the plans illustrated in this article may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

ANIMAL HEALTH

Treatment Against Worm Parasites of Cattle.

A. K. SUTHERLAND and R. REIK, Animal Health Station, Yeerongpilly.

THE worms affecting cattle in Queensland are described in the Department's pamphlet "Parasitic Worm Diseases of Cattle." The introduction of phenothiazine and wartime shortages of other drugs (e.g. tetrachlorethylene) necessitates some amendments to the treatments described in the pamphlet.

Drenches.

1. *Bluestone Solution*.—

Dissolve 1 lb. of bluestone crystals in 2½ gallons water.

Dose rates:—

Calves	2-4 months old,	1½-2 fl. oz.
Calves	4-8 months old,	2-3 fl. oz.
Calves	8-12 months old,	3-4 fl. oz.
Calves	12-18 months old,	4-5 fl. oz.

This drench is cheap and simple to prepare and bluestone is readily available from country storekeepers. It is effective only against the large stomach worm (*Haemonchus*), but, as this is the parasite which usually does most damage, good results are generally obtained. A second treatment should be given two to three weeks after the first.

2. *Bluestone-Nicotine Sulphate*.—

Supplies of nicotine sulphate (Black leaf 40) are not plentiful but if it is available it can be added to bluestone solution to make a drench which is effective against large stomach worms, small brown stomach worms, small intestinal worms, and tape worms.

Dissolve 1 lb. bluestone in 5 gallons of water and add 16 fluid oz. of nicotine sulphate.

Dose rate—2 fl. oz. per 100 lb. body weight. The maximum dose for any animal, irrespective of weight, is 4 fl. oz.

Nicotine must be used with care. If the calves are weak or anaemic reduce the dose or, better still, use bluestone alone and then treat with bluestone-nicotine when they have improved in condition.

3. *Phenothiazine*.—

Phenothiazine is the best general treatment and will remove most of the worm parasites. It is the only effective treatment for the large bowel (nodule) worm.

The doses of powder recommended are—

For grown cattle, not more than 2 oz.

For cattle above 12 months old, not more than 1½ oz.

For calves about 6 months old, not more than 1 oz.

If the brands of phenothiazine now on the market are mixed at the rate of 1 lb. of powder to 12 fl. oz. of water a suitable suspension is produced and the above amounts of phenothiazine will be contained in the following doses of the mixture:—

Grown cattle—3 fl. oz.

Cattle about 12 months—2½ fl. oz.

Calves 6 months old—1½ fl. oz.

The powder should be sieved to remove lumps and then the water is stirred in to form a suspension resembling thin cement. This suspension is best given with a drenching gun, but drenching funnels or bottles may be used.

Calves are not as tolerant to phenothiazine as sheep and ill effects are sometimes seen, particularly if an overdose is given. If young cattle in very poor condition are being treated, it is advisable to reduce the dose rate and repeat treatment later when the animals have improved in condition.

The urine of animals treated with phenothiazine will be red for a few days but soon returns to normal.

Phenothiazine is available (usually in 1 lb., 5 lb., and 7 lb. packets) from farm and station suppliers and many country chemists, or from—

Imperial Chemical Industries, 100 Creek street, Brisbane;

Taylor Elliotts, Charlotte street, Brisbane;

Wm. Cooper & Nephews, Box 3946V, G.P.O., Sydney, N.S.W.

Treatment of Lung Worms.

Lungworm is usually accompanied by moderate to heavy infestation with stomach and intestinal worms but the cough due to lungworms usually attracts most attention so that the effects of the other parasites are overlooked. There is no efficient specific treatment for lungworm. Injections into the windpipe have been often used, but this treatment is of doubtful efficiency and it is not recommended. Furthermore, some of the ingredients of the mixtures used are not now available.

If infected calves are drenched with phenothiazine to remove stomach and intestinal parasites and put on to good feed, their natural resistance will be increased, so that they can overcome lungworm infestation. A natural age resistance to lungworm is developed as calves grow older. Failing phenothiazine, use bluestone or bluestone-nicotine sulphate. Note that calves infected with lungworms are often in poor condition so it may be necessary to use a reduced dose of phenothiazine and repeat treatment later with a full dose.

Preventive Measures.

General control measures to minimise worm infestations are described in the pamphlet mentioned previously.

When calves are drenched they should be turned into a paddock which has not carried sheep or cattle for a month. A pasture contaminated with worm eggs and larvae may reinfest the calves so quickly that little benefit is obtained from the drenching.

Good feeding helps the animal to resist worm infestation and its effects. If after drenching calves are turned on to good feed in a spelled paddock, they will derive the maximum benefit from the treatment.

Good management and feeding will minimise the amount of drenching required during the year.

Treatment of Pigs for Large Roundworm Infestation.

A. K. SUTHERLAND and R. REIK, Animal Health Station, Yeerongpilly.

LARGE roundworms (*Ascaris lumbricoides*) can be removed from the intestine of pigs by giving the proper dose of phenothiazine powder in a small feed. Drenching with oil of chenopodium in castor oil is also very efficient, but chenopodium has been unprocureable since early in the war.

The following procedure is recommended for giving phenothiazine:

Divide the pigs into groups according to their weights and confine each group in a pen or yard.

Starve for 18 to 20 hours so that the feed containing the drug will be readily eaten.

The doses of the powder are as follows:—

Pigs of 25 lb. live weight	..	..	..	5 grams ($\frac{1}{8}$ oz.)
25 to 50 lb. live weight	..	..	..	8 grams ($\frac{1}{4}$ oz.)
50 to 100 lb. live weight	..	..	..	12 grams ($\frac{1}{2}$ oz.)
100 to 200 lb. live weight	..	..	..	20 grams ($\frac{2}{3}$ oz.)
Over 200 lb. live weight	..	..	..	30 grams (1 oz.)

The appropriate weight of phenothiazine (accurately weighed) for each group is mixed with about four times its weight of dry ground feed (such as crushed wheat, pollard, etc.). The pigs should have plenty of troughing space so that each one in the group will eat his share of the drug.

If the pigs are accustomed to slop feeding the phenothiazine may be fed in a thick mass—but not in watery slops.

The urine of treated pigs will be red for 4 to 5 days but soon returns to normal.

Giving phenothiazine to a group of pigs in their feed as described here is less efficient than drenching each pig individually with the appropriate dose of a phenothiazine-water mixture. However, pigs are difficult to drench and the above method is advised because it is simple and effective.

Note that with mass treatment the greedy or aggressive pigs may take excessive doses of phenothiazine and show ill effects.

The life cycle of the large round worm and its effect on pigs and recommended preventive measures are described in the pamphlet "Parasitic Worm Diseases of the Pig" so it is necessary to mention here only certain points which have a bearing on treatment.

Pigs become infested by eating worm eggs which contaminate their food. These eggs have come from worms living in the bowel of other pigs. When pigs feed off the ground or can place their feet covered with mud containing worm eggs in the troughs, they cannot escape infestation. These eggs hatch into immature worms (larvae) which migrate through the liver and lungs before finally settling as adults in the intestine of the pig. The larvae do much damage in the liver and lungs, which results in stunted growth and unthriftiness and coughing (which may persist for months). Pneumonia due to bacterial invasion of damaged lung tissue is a common sequel. These are the most serious effects of the parasite, and are seen in pigs up to 4 or 5 months of age. The adult worms living in the intestine are also harmful but are usually found only in pigs over 2 months of age. A few adult worms may produce no recognisable symptoms but they lay an enormous number of eggs which are very dangerous to the young pigs.

Phenothiazine or oil of chenopodium will remove the adult worms from the intestine but no drug will have any effect on larvae in the liver and lungs. The above facts lead to the following points which must be remembered when applying treatment—

- (i.) Treatment is successful in removing only those worms which are in the intestine.
- (ii.) Young pigs suffering from the effects of infestation with larvae only will not be benefited by treatment, and
- (iii.) Worms which are in the larval stage when treatment is given will continue their development unharmed to the adult stage and thus may give the false impression that the drug did not remove those adult roundworms which were in the intestine at the time of treatment.

Control measures must aim therefore at preventing infestation of young pigs. This is achieved by the sanitation described in the above mentioned pamphlet and by treating all the older pigs on the property so as to remove the egg laying worms. Efficient treatment twice yearly should be sufficient if yards and runs are managed hygienically.

Phenothiazine is available in 1 lb., 5 lb., and 7 lb. packages from farm and station suppliers and from many country chemists, or from:—

Imperial Chemical Industries, 100 Creek street, Brisbane;

Taylor Elliotts Pty. Ltd., Charlotte street, Brisbane;

William Cooper & Nephews, Box 3946V, G.P.O., Sydney.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to the Department of Agriculture and Stock, Brisbane, without delay.

Phenothiazine for Worm Parasites in Horses.

A. K. SUTHERLAND and R. REIK, Animal Health Station, Yeerongpilly.

PHENOTHIAZINE is the most efficient drug for the treatment of horses infested with redworm (*Strongyles*). Of the worm parasites infesting horses, the redworm is the most damaging. Young horses may be heavily infested with large roundworms (*Ascaris equorum*) and phenothiazine will also remove these worms satisfactorily.

The phenothiazine powder is best given in the feed in the following doses:

Draught horses, 30 gram. (1 oz.).

Light draughts and saddle horses, 25 gram. ($\frac{3}{4}$ oz.).

Yearlings and ponies, 20 gram. ($\frac{2}{3}$ oz.).

Phenothiazine is not always safe for horses and some animals show serious ill effects after treatment. In order to reduce the chances of such ill effects taking place, it is suggested that the dose be divided into 3 or 4 parts and one of these given each day until the full dose has been received.

Most horses readily consume the treated food, especially if a little molasses is added. Starvation before treatment is not necessary. Bran mashes should be fed before, during and after treatment, but if the horses are on green feed and the bowels are free, this is not essential.

The urine of treated animals becomes red when exposed to the air but the colour returns to normal in 4 to 5 days.

Horses should be spelled after treatment for about five days or until the colour of the urine returns to normal.

All the horses in a mob should be treated even though only a few are showing symptoms.

After treatment the horses should be run in a paddock which has carried no horses for a few months.

Phenothiazine is available in 1 lb., 5 lb. and 7 lb. packages from farm and station suppliers and from many country chemists, or from

Imperial Chemical Industries, 100 Creek street, Brisbane.

Taylor Elliotts Pty. Ltd., Charlotte street, Brisbane.

William Cooper & Nephews, Box 3946V, G.P.O., Sydney.

PULSE, TEMPERATURE, RESPIRATION.

Appended figures should prove helpful in diagnosing and treatment of diseases in livestock:—

			Pulse a Minute.	Respiration a Minute.	Normal Temp.
Horse	..	..	38-43	8-12	100
Cow	..	..	50-60	12-16	101
Sheep	..	..	75-80	20-30	103
Pig	..	..	70-80	20-30	102
Dog	..	..	80-90	15-25	101

GADGETS AND WRINKLES

Tank Measurements

CIRCULAR TANKS.

To find the area of Circular Tanks and Cisterns,—

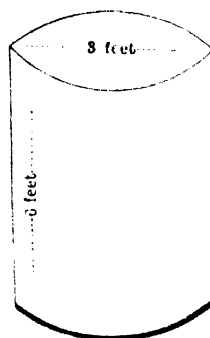
Square the diameter, multiply by .7854, multiply by depth.

EXAMPLE 1.

Tank measures 3 feet in diameter by 6 feet deep.

Square the diameter $3 \times 3 = 9$ feet.

$$\begin{array}{r}
 9 \text{ feet} \times .7854 \times 6 \\
 \hline
 9 \\
 7.0686 \\
 6 \\
 \hline
 42.4116
 \end{array}$$



= 42.4116 cubic feet in the tank, or almost $42\frac{1}{2}$ cubic feet.

As there are $6\frac{1}{4}$ Imperial gallons in 1 cubic foot of water, multiplying the above 42.4116 by $6\frac{1}{4}$ gives the number of gallons in the tank.

Thus,— $42.4116 \times 6\frac{1}{4}$

$$\begin{array}{r}
 2544696 \\
 106029 \\
 \hline
 \end{array}$$

265.0725 gallons, (very little over 265 gallons.)

CIRCULAR TANKS.

EXAMPLE 2.

A shorter formula by which the capacity in gallons could be ascertained is:—

Square the diameter, \times by depth, \times by 4.908:

$$\begin{array}{r}
 3 \times 3 = 9 \times 6 \times 4.908 \\
 6
 \end{array}$$

$$\begin{array}{r}
 29.448 \\
 9 \\
 \hline
 \end{array}$$

265.032 gallons.

Or,—Square diameter, \times by depth, \times by $4\frac{9}{16}$, would give it roughly

$$3 \times 3 = 9 \times 6 \times 4\frac{9}{16}$$

$$\begin{array}{r} 54 \\ 4\frac{9}{16} \\ \hline 216 \\ 48\frac{1}{2} \\ \hline 264\frac{1}{2} \\ \hline \hline \end{array}$$

EXAMPLE 3.

Another way of finding the capacity in gallons, which might be used by those not familiar with fractions:—

Square the diameter in inches, multiply by the depth in inches, divide by 353.
Circular tank measures 3 feet in diameter by 6 feet deep.

$$36 \times 36 \times 72 \div 353.$$

$$\begin{array}{r} 36 \\ 36 \\ \hline 216 \\ 108 \\ \hline 1296 \\ 72 \\ \hline 2592 \\ 9072 \end{array}$$

$$353 \overline{) 93312} (264\frac{1}{2} \text{ gallons (about)}$$

$$\begin{array}{r} 706 \\ 2271 \\ 2118 \\ \hline 1532 \\ 1412 \\ \hline 120 \end{array}$$

Having found the number of gallons, to find the number of cubic feet, divide by 6 $\frac{1}{4}$. To divide by 6 $\frac{1}{4}$, multiply by 4, and divide by 25.

Thus.—264 $\frac{1}{2}$ gallons divide by 6 $\frac{1}{4}$.

$$\begin{array}{r} 4 \\ \hline 25 \left\{ \begin{array}{l} 5 \overline{) 1058} \\ 5 \overline{) 2113} \\ \hline 121 \end{array} \right\} \frac{4}{25} = \text{almost } 42\frac{1}{2} \text{ cubic feet.} \end{array}$$

These formulae do not work out with mathematical precision, but are sufficiently accurate for practical purposes.

PRESERVING WIRE NETTING.

A good plan is to mix a portion of cement in the tar used for the purpose. When dried it forms a coat which lasts, whereas tar alone soon leaves the netting when underground.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BABY'S HEALTH: NATION'S WEALTH.

Winter Ills and the Children.

DO you know that last year approximately 1,110 babies and children died before they reached the age of 5 years? Of these, 158 died from respiratory infections (those which affect the nose, throat, bronchial tubes and lungs). The sickness rate from these infections was, of course, much higher. Since parents have learnt to understand the dangers of summer diarrhoea there has been a great lessening in the death and sickness rate from that disease, and so now it is the duty of every mother and father to learn about the respiratory infections, so that they can help to lessen the number of children who contract them and thus prevent much unnecessary illness and suffering among the little ones. As you know, these diseases are usually much more prevalent in the winter because buildings and public vehicles are closed up to keep out draughts. It is in badly ventilated rooms and vehicles that the germs which are contained in the droplets sprayed into the atmosphere by careless people coughing and sneezing without covering nose and mouth with a handkerchief are spread to anyone within 4 feet and at the same height as or lower than the person sneezing.

The trouble is that we accept the common cold as inevitable, and not much to worry about, and do not realise that it is the forerunner of bronchitis and pneumonia and leads to a lowered resistance to other infections as well. The common cold is highly infectious and unfortunately one attack does not give immunity, but there should not be as many children as there are whose mothers complain that they are "always catching colds."

Let us see what can be done to improve the position.

Prevention of Colds.

The great thing is to increase the children's resistance. Keep the house well ventilated and have the children out of doors as much as possible in the daytime, even when the weather is cold, provided they are playing actively. Make use of every half hour of sunshine. Do not allow young children into over-crowded buildings. Do not let baby sleep in the kitchen—a sunny veranda is much better, provided he is warmly covered.

Dress the children according to the temperature of the day, not of the season. The heat-regulating mechanism of the body deals with ordinary changes of temperature. Constant overclothing weakens this mechanism and increases the danger of chilling when the clothes are removed.

See that the children have a long, unbroken sleep at night and a daytime sleep or rest as well.

Give a quick, cool sponge and a brisk, vigorous rub down after the bath every morning.

When lifting children from a warm bed after a sleep protect them carefully from sudden chilling.

See that the children have a nourishing and vitamin rich diet, their full supply of milk—fresh or dried—their full ration of butter, cheese, if they are old enough, and plenty of yellow and green vegetables and fruits, wholemeal bread, and porridges. If they have been subject to frequent colds, one of the fish liver oil preparations, such as Cod and Halibut, may be given daily during the cold weather. All artificially-fed babies should have one of these in addition to their food.

Because colds are so infectious, keep children away from anyone who has a cold or other respiratory trouble. Do not allow children to be kissed and fondled indiscriminately. Even members of his own family should not kiss a child on the mouth.

Questions on this or any other subject concerning Maternal and Child Welfare will be answered by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane, or by addressing letters, "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

Pork Chops Grande.

Allow one pork chop for each person, fry in the usual way and, while frying, prepare two onions peeled and sliced, two sticks of celery finely sliced. Fry in one dessertspoonful of butter. When cooked add two well-beaten eggs and half a cupful of milk. Stir for a few seconds. Place the chops, well drained, on a hot dish and pour savoury around. Serve with mashed potatoes.

Pork Pie.

Take 1 lb. minced pork, 1 pig's foot (for jelly), and prepare as follows:—Take 1 lb. self-raising flour, melt $\frac{1}{2}$ lb. lard, pour over flour and work into a dough. Line a cake tin, fill with minced pork, and cover with remaining dough. Bake in moderate oven for one hour. Cover pig's foot with water, bring to boil, and allow to simmer for one and a-half hours. Strain and season to taste. Allow stock and pie to cool a little, then pour pig's foot stock into the pie and allow to cool and set.

This is a very nice dish and is readily prepared. If available, two pig's feet may be used instead of one to provide for a richer stock and jelly.

Bran Biscuits.

Ingredients:—1 cup bran, 1 cup S.R. flour, $\frac{1}{4}$ lb. dripping, $\frac{1}{4}$ lb. sugar, 1 egg. *Method:*—Cream butter and sugar, add egg and beat well. Mix S.R. flour and bran together and stir into mixture. Roll out thin, cut into rounds or fingers, and bake on greased slide in moderate oven.

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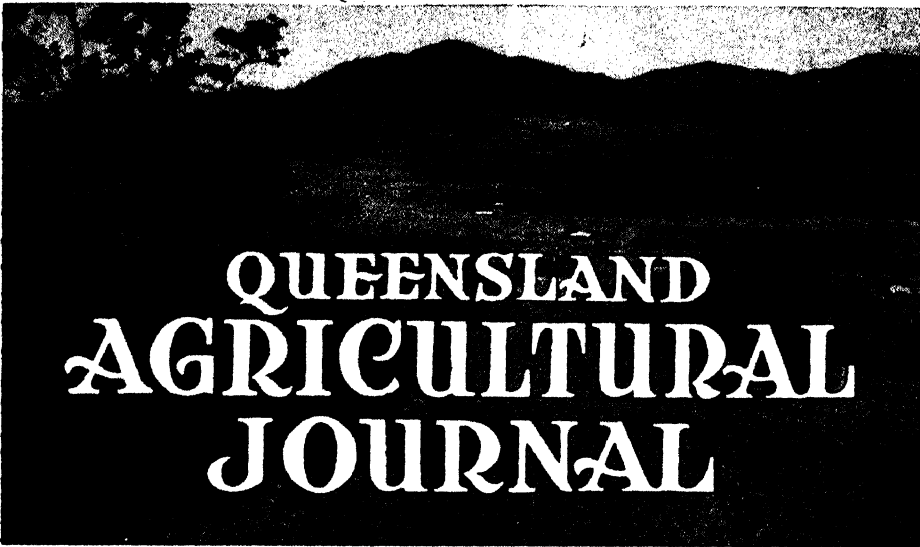


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QUEENSLAND AGRICULTURAL JOURNAL

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1 AUGUST, 1944

Part 2

Event and Comment.

Rural Development in Queensland.

AS set out in the Opening Speech of His Excellency the Governor, many important proposals bearing directly or indirectly on the welfare and progress of rural industry are listed for consideration in the course of the present Session of the Queensland Parliament. Following is a summary of the matters to be submitted:

Although the necessities of war are of paramount importance, much attention is to be given to plans in preparation for the difficulties which will surely arise when the war is over. The possibilities of development in this State are very great, and the experience gained in the hard school of war is being applied in the work of the departments directly concerned with the tasks of rehabilitation and construction.

A new scheme for subsidising many types of the works of the various local bodies has been adopted. Under the new subsidy scheme, rates ranging from 15 per cent. up to a maximum of 50 per cent. on capital cost (or the equivalent in annual interest and redemption charges) will be available for approved capital works. The existing subsidy scheme of 50 per cent. for mosquito eradication and malarial control will be continued. A variable schedule of rates has been designed to ensure that the new subsidy proposals will provide the greatest possible measure of assistance to the most essential public utilities, including the acceptance of a new principle of subsidising certain electrical works, such as extensions into the rural areas and the inter-connection of power systems between widely separated areas. New subsidy proposals in regard to water conservation and irrigation schemes have been adopted under which, in the case of head works construction, the State will contribute from 50 to 100 per cent. of the cost, and in the case of local weirs from 25 to 50 per cent. of the cost.

The State Electricity Commission is preparing plans for the post-war period, and it is proposed to introduce legislation to enable the carrying out of a properly planned and comprehensive programme of electrical development throughout the State.

A Bureau of Investigation has been constituted, under *The Land and Water Resources Development Act*, and is proceeding with its investigations, the immediate purpose of which is to prepare for the anticipated heavy demand for land after the war. The construction of a very considerable number of weirs in the watercourses of the State and the provision of subsidiary waterworks are contemplated under the general plan. Advance allocations of finance have been approved for water conservation and irrigation projects. Such works will be administered by irrigation and water supply boards constituted under the Act, a proportion of the cost being chargeable to the Boards as a loan. It has been necessary, as an indispensable preliminary to forward planning, to assess for a number of years ahead, the probable amount of funds to be available annually for public works, together with a preliminary allocation between various purposes of these estimated financial resources, to serve as objectives within which schemes may be surveyed and planned with some certainty of final construction. As a result of this survey, it is anticipated that an adequate amount will be available for expenditure on works and development in the first five post-war years, including some £6 million for maintenance and renewal of railways, roads, and other public assets to which it has not been possible to devote the required attention during the war. Reserve Funds under *The Post War Reconstruction and Development Trust Fund Act* have been established, so that at the termination of the war, or even before, if found necessary, and as labour and materials become available, there may be immediate implementation of the programme. At the 30th June, 1944, £8,420,000 stood to the credit of the Fund.

Transport problems also are to receive close attention. While, undoubtedly, there will be much expansion in other forms of transport, goods carriage on road, rail, and sea will long continue to predominate. Rail and road transport are collaterals, consequently there should be close co-ordination of these sections in the interests of efficiency, economy, and community service. In respect of arrangements for passenger traffic by road and auxiliary means, a measure of decentralised management in matters of purely local concern, subject to general supervision and control by the central authority is favoured.

Food production must continue as an increasingly important factor in Australia's war effort and Queensland, in common with other States of the Commonwealth, is making and must continue to make a substantial contribution to Allied food supplies. A high volume of food production will also be necessary in the post-war period in fulfilment of obligations in respect of the feeding of the peoples of the liberated countries. The State Government is co-operating wholeheartedly with the Commonwealth Government in its efforts to meet local civilian, Service, and overseas demands.

Among the new measures to be introduced in the course of the Session are a Co-ordination of Rural Advances and Agricultural Bank Acts Amendment Bill; a State Electricity Commission and Electric Light and Power Acts Amendment Bill; a Stock Routes Improvement and Animal and Vegetable Pests Destruction Act Amendment Bill; and a Valuation of Land Bill.

Field Crops

Green Manures in the Tobacco Crop Rotation.

R. C. CANNON, Instructor in Agriculture.

IT has been the experience of tobacco farmers in North Queensland that they invariably obtain the best results from newly-cleared, virgin land. As successive crops have been grown there has been, despite increasingly heavy applications of artificial manures, a progressive decrease in yields coupled with a corresponding falling off in quality. This experience is by no means restricted to tobacco growing in the tropics, but is common to all types of farming under varying climatic conditions. There is no doubt that this condition is accentuated in tropical areas for reasons which will be outlined later. Soils which behave in this manner are popularly described as "played out." What is the cause of this condition, and what can the farmer do to overcome it?

Soil fertility is bound up very intimately with the organic matter in the soil, which is derived from the decay of plant and animal residues and is commonly termed "humus." There are several aspects of soil humus which have special application to sandy tobacco-growing soils. These include the effects of humus on the availability of plant foods and on the physical condition of the soil, and the relationship of humus to nematode populations.

Effects of Humus on Availability of Plant Foods.

The importance of humus in the production of good quality tobacco leaf must be emphasised. To a large measure this factor of leaf quality is bound up with the availability and continuous supply of nitrogen in a form in which it can be assimilated by the growing plant. The mere presence in the soil of nitrogenous compounds does not necessarily satisfy plant requirements. Plants require certain specific forms of nitrogen for their nutrition and it is in the continuous supply of these compounds that soil micro-organisms play an important part. In the sandy soils of the tobacco areas these microbes are important whether the nitrogen supplied by manures is organic material or in the form of nitrates.

In the soil, organic substances undergo a series of changes and the nitrogen is easily liberated in a form in which it can be taken up by plants. This process of nitrogen liberation is brought about by the activities of many types of micro-organisms, all of which thrive under conditions associated with abundant humus. Dried blood is commonly

the source of part of the nitrogen supplied in artificial fertilizer mixtures designed for use on tobacco grown on sandy soils, since it is broken down gradually, thus yielding a steady supply of nitrogen to the plants.

A part of the total nitrogen of a tobacco mixture is provided in the form of nitrates, usually nitrate of soda, so as to give some immediately available nitrogen for the transplants. In this form it is readily available for plant growth, but much may be lost through leaching by rains. In the case of well-drained sandy soils subject to heavy rainfall nitrates not immediately utilised by the plant may frequently be lost in this way. The presence of an abundant supply of humus in the soil results indirectly in the retention of the nitrate—the micro-organisms which feed on the humus take up the nitrate and ultimately release it as they die.

Effects of Humus on the Physical Condition of the Soil.

Soil is made up of particles varying in size from coarse sand to the finest clay. When soil in good tilth dries or is handled it breaks up into crumbs composed of soil particles loosely cemented together. Between the crumbs and within the crumbs themselves are minute pore spaces occupied by air or water, both of which are vital to plant life. As these crumbs break down so the soil particles become more and more closely packed together, thereby reducing the air- and water-holding capacity of the mass. Normally the cementing agent may be clay or humus, or both. Humus produces a loose, spongy structure which has an enormous capacity for absorbing moisture. Where clay is the principal cementing agent the structure is less spongy.

North Queensland tobacco soils contain a relatively small amount of clay and their humus content is equally low. Even virgin soil does not



Plate 36.

SIMPLICITY GARDEN TRACTOR.—Attachable equipment. Mounted on the cultivator frame are adjustable standards for depth and spacing and on these standards various tool points—tines, duckfeet, weeding hoes, and furrowers (as shown)—are attachable.

exhibit a particularly good crumb structure and continued cropping and cultivation tend to reduce the soil to a condition in which even a light shower will tend to cause a "caking" of the surface, a condition with which most tobacco farmers are only too familiar. This crust seriously interferes with aeration and considerably reduces the capacity of the soil to absorb water quickly. This means that much of the rainfall does not penetrate the soil but is lost through surface run-off. The early rains in the northern tobacco areas are so sporadic that growers can ill afford to lose any of the moisture which they should add to the soil. No amount of cultivation in itself can entirely overcome these adverse effects, but they can be mitigated by the addition of humus to the soil.

Another point to be considered is the relationship of soil structure to the incidence of soil erosion. It is only when soil is unable to absorb rainfall as fast as it falls that surface run-off occurs to produce erosion. This capacity of a soil to absorb rainfall is determined by the pore-space, which itself is determined by the extent of aggregation of the composite soil particles. The formation of a surface crust referred to above renders the soil incapable of absorbing much of the rainfall as it is precipitated and the surface run-off carries away quantities of the loose soil particles.

Relationship of Humus to Nematodes.

As mentioned earlier, the presence in the soil of organic matter favours the activities of micro-organisms. This applies to many species which live at the expense of harmful organisms, such as nematodes. There are many species of fungi which have become adapted to the capture, and ultimate destruction, of soil nematodes by the development of special trapping devices. In addition there are a number of free-living nematodes which are not parasitic on plants but attack other

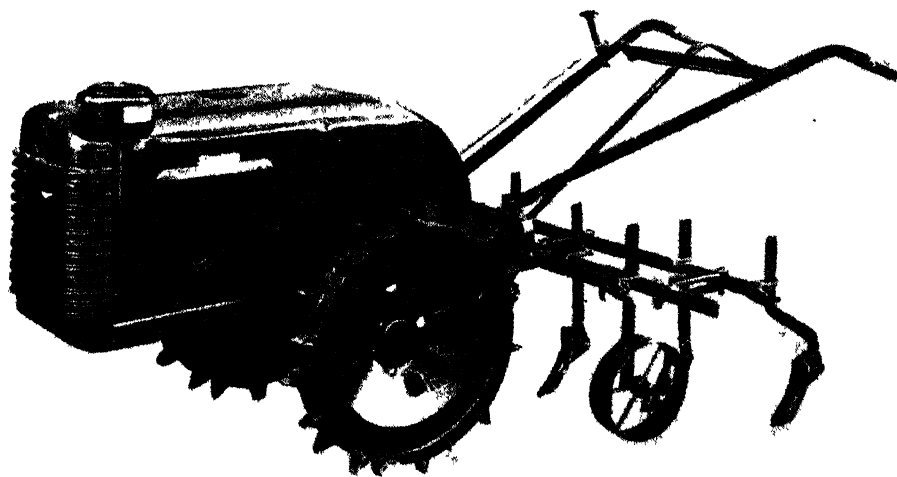


Plate 37.

SIMPLICITY GARDEN TRACTOR.—A machine new to Queensland. Units powered with a 3-h.p. engine, complete with attachments, are available for immediate delivery (£131 15s. f.o.r. Brisbane). See also Plates 36 and 38.

nematode species, including the species which is such a serious pest of tobacco. Due principally to the activities of these different groups of organisms the presence of decaying organic matter in the soil has been shown to decrease the population of plant-parasitic nematodes.

Humus in North Queensland Tobacco Soils.

Tobacco in North Queensland is grown on relatively poor, sandy soils supporting an open forest. Even virgin soils are typically low in humus, for the natural vegetative cover is comparatively sparse, hence there cannot be a particularly large volume of organic remains being added to the soil surface. At the same time the sparse vegetation exposes the soil to the heat of the sun's rays. This means that the soil temperature is maintained at a fairly high level for the greater part of the year and for many hours of the day. Evidence from many parts of the world indicates that humus decomposition is favoured by high soil temperatures which accelerate the activities of the soil micro-organisms. Apart altogether from the activities of these microbes there is the further loss of humus-forming materials brought about by the annual recurrence of grass fires.

It is obvious, furthermore, that conditions associated with cultivation, necessary though it is, must accelerate the natural depletion of humus reserves. Once the land is cleared of its natural, protective vegetation the effect of the sun's rays become greater. Admittedly, some protection may still be afforded by the growing crop, but the land is exposed for a long period between successive crops. The lack of a reliable winter rainfall in the tobacco areas of North Queensland, unfortunately, makes it very difficult to provide a winter cover crop other than the natural grass and weeds.

All of these factors make it imperative that a far-seeing farmer should seriously consider what means are at his disposal for the main-

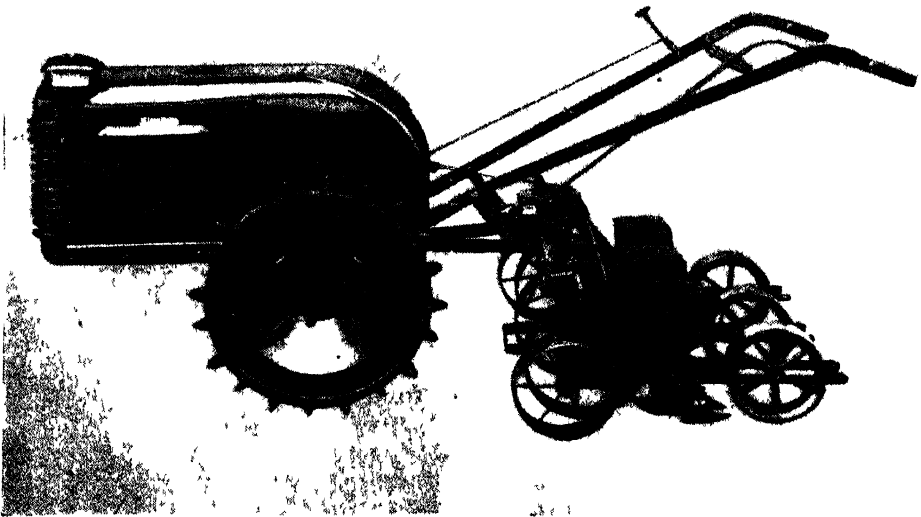


Plate 38.

SIMPLICITY GARDEN TRACTOR.—The sowing attachment comprises three seed boxes bracketed with a frame attachable to the tool bar and adjustable to different widths as a 3-row seeder.

tenance of an adequate reserve of humus in the soil. The time has gone when even the short-sighted farmer can think of planning on the basis of clearing new land each year, as quite a large proportion of the virgin land on farms has already been exploited. Replenishment of soil humus may best be done in the tobacco areas by ploughing in suitable green manure crops.

Green Manures in the Tobacco Rotation.

In determining the type of green manure to be grown many factors have to be taken into consideration, chief among which are the following:—

- (a) Type of green manure, e.g., whether legume or grass;
- (b) Suitability of green crops to soil and climate;
- (c) Period of maturity of green crops;
- (d) Susceptibility to nematode attack; and
- (e) Ease of handling and labour involved.

Too high a proportion of organic material of a high carbon content is undesirable, and this points to a legume as the most desirable type of green manure, though it is possible that a legume in combination with a grass may also be of advantage. If only one type of green crop is to be included in the rotation it should undoubtedly be a legume. In view of the rainfall distribution in northern tobacco areas the crop selected must be quick maturing—it is essential that the green crop be ploughed under while the soil is still in a moist condition after the monsoonal rains, otherwise decomposition will proceed too slowly. In view of the seriousness of the nematode problem, any crop selected should possess a relatively high degree of resistance to nematode attack. It would be foolish to include in the rotation a crop which is highly susceptible to nematode attack and which would, therefore, breed up the pest. At this stage in our knowledge we cannot assume that the process of decay of organic matter would so reduce the nematode population of the soil as to permit us to deliberately breed the pest in a crop designed to reduce the soil population. Hence it is considered that a green crop known to be susceptible to nematodes should be avoided.

The last point is very important. It is recognised that the growing of a green manurial crop does cost something in cash and valuable time and labour. The value of a green manure is reflected in the increased crop returns of the subsequent tobacco crop. If a cash return can be obtained from such a rotational crop so much the better, but this should not be the determining factor. A quick-growing crop is always less costly to handle on account of the fact that weed competition becomes of minor importance and cultivation costs are thereby reduced. Such crops can usually be sown broadcast and cultivations omitted altogether.

With the object of determining the most suitable green manures, and the most suitable types of rotation, for tobacco in North Queensland long term experimental work was inaugurated three years ago at Mareeba. Despite complicating wartime conditions this work has been continued and the first set of data will be available from last season's crop. This will be supplemented by data in each successive year, and as this accumulates this Department will be in a better position to make more definite recommendations as to tobacco crop rotations. In the meantime suggestions may be made, although these may have to be

amended in the light of further experimental evidence. For the guidance of farmers a number of possible green manure crops suitable for North Queensland will be discussed separately hereunder.

Peanuts.—Peanuts are only very slightly susceptible to attack by plant-parasitic nematodes and may with safety be included in a tobacco rotation. They do not yield an exceptionally heavy body of greenstuff, nor do they provide a perfect soil cover. On account of weed growth it is necessary that provision should be made for one or two cultivations during the earlier growing period. In order to provide as good a cover as possible they should be sown in rows as close together as cultivation implements will permit. For the best results the crop should be ploughed under just before maturity and before the foliage begins to die. Normally this stage should be reached soon after the conclusion of the monsoonal rains and before the soil has dried excessively. If left too late undecayed kernels may be troublesome. Some may germinate among the tobacco crop while others will be attractive to bandicoots, which may disturb many tobacco plants as they dig in search of the buried "nuts." Some farmers fear that the ploughing under of a crop of peanuts may so enrich the soil with nitrogen as to adversely affect the quality of the tobacco leaf. Provided the crop has been ploughed under while the soil is in a moist condition favourable to the decomposition of the organic matter and followed by a fertilizer mixture relatively low in nitrogen, this has not so far proved to be the case. Growth has been more vigorous and the leaf has tended to be heavier and darker, but not excessively so.

Velvet Beans.—This legume, also, is relatively resistant to root-knot nematode attacks. It can provide a large body of greenstuff and provides an excellent soil cover. It is usually grown in rows with maize, which acts primarily as a support. The inclusion of maize is not altogether satisfactory, as a proportion of the broken stalks may not be sufficiently decomposed before the subsequent tobacco crop is planted. The broken stubble can be very troublesome during planting out and subsequent early cultivations. Probably a less sturdy supporting crop would be preferable, or it may even be omitted altogether. This crop does not reach full maturity before the end of the monsoonal rains and it is in good condition for turning under soon after the rains have ended.

Crotalaria goreensis.—This legume has been selected on account of its relative immunity to nematode attack and its suitability for broadcast sowing. It has one distinct disadvantage in its slow growth in the earlier stages, whereby weed growth is able to seriously compete with it. In addition, the germination is not good, and further accentuates this fault. There is some evidence, however, that better results might be obtained by allowing the first rains to germinate a proportion of the weeds, which can be destroyed by cultivation before the sowing of the *Crotalaria* seed. Even where weed growth has appeared to have been excessive, later growth in the *Crotalaria* has been observed to have eventually smothered the weeds. Under good conditions the crop may attain a height of 5 to 6 feet and provides an excellent cover and a good body of green material. When some of the abovementioned difficulties can be overcome this legume may supersede others so far tried.

In South Africa another species, *Crotalaria juncea*, has been used with some success in the tobacco rotation. It may well be that others

of the many species of *Crotalaria* may later prove to be better suited to our requirements.

Cowpeas.—A number of farmers have tried this legume in a tobacco rotation, but the results have been very conflicting. However, in view of the high susceptibility of local species to nematode attack, it is considered undesirable from that point of view alone. The Iron variety of cowpea, which is well known in the United States of America, is reputedly resistant to nematodes. This variety has not yet been tried in the tobacco areas but may prove satisfactory.

Sudan Grass.—In the absence of other sources of organic matter it is considered that too high a proportion of carbon would be added to the soil, thus immobilising too large a part of the otherwise available nitrates. Information so far available points to this conclusion and results following this grass have been disappointing. It possesses many of the desirable qualities outlined earlier—it is easy to grow, it can be sown broadcast, and it grows rapidly and is able to smother weed growth—and there is reason to believe that it may have a definite place in the tobacco rotation following, or perhaps preceding, a legume.

Briefly, there are three main reasons for including a green manure in the tobacco rotation:—

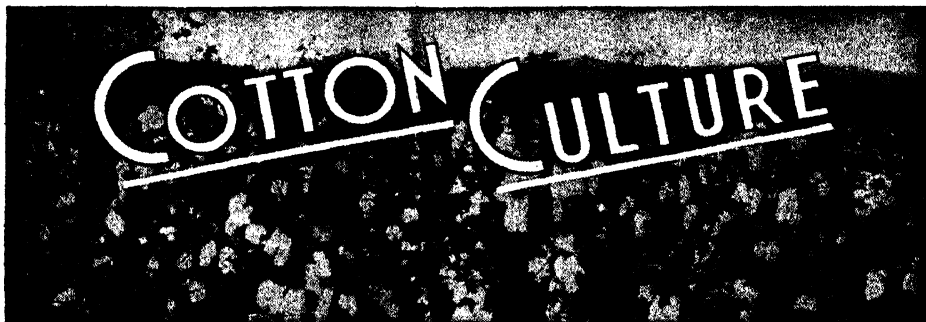
- (1) To improve the general fertility of the soil, which will be reflected in improved leaf quality.
- (2) To improve the soil structure so as to absorb and retain the maximum amount of the natural rainfall, with a consequent checking of soil erosion.
- (3) To reduce the losses brought about by nematode attacks in the tobacco crop.

Broadly speaking, any green manure will be better than none at all. Farmers would be well advised to immediately plan for the inclusion of a green manurial crop in their rotation, selecting their crop in the light of the preliminary information supplied above.



Plate 39.

WHEN THE RAIN CAME.—Jimbour Plain, near Dalby.



Crop Rotations for Farms in Cotton Districts.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

THE bulk of the cotton crop grown in this State is planted in districts which receive an average annual rainfall of less than 30 inches. The more important of these districts are the Dee and the Don Valleys adjacent to Wowan, the Dawson Valley, the Callide Valley, the Upper Burnett, the western half of the Central and Southern Burnett, the Northern Darling Downs, and the Northern Maranoa.

The rainfall in these districts is variable but approximately 25 per cent. of the year's total occurs during August, September, and October, 50 per cent. during November, December, January, and February, and the remainder in the rest of the year. October is usually the wettest month of the first period, January or February of the second period, and March of the third period, although June is a fairly reliable month for soaking rains.

Owing to the general similarity of the climates and soils in these districts, the same crops can be grown in all of them. These include wheat for grain and grazing in the last two districts and for mostly grazing in the others, oats for grazing and some hay, grain and sweet sorghums, sudan grass, maize (except in the drier areas), cotton, and pumpkins. Large areas of both native and Rhodes grass pastures supply grazing for dairy cows and horses. Lucerne is grown under rainfall conditions on alluvial soils where the water table is sufficiently close to the surface to provide moisture during dry periods, and occasional areas of cowpeas are sown for grazing.

Cropping Programme.

With such a diversity of crops, a comprehensive rotational programme is required on each farm to ensure that the best use is made of the available land. Obviously it would be difficult to include in a short article specific recommendations for cropping programmes that would meet the requirements of every farm in districts where dairying and cotton-growing are conducted. Certain basic factors apply to all such farms, however, and these are briefly presented in order that every grower may carefully examine their applicability to his property.

Broadly speaking, good farming is only possible when the cropping capabilities of the different soils on the farm are understood and the property is subdivided so that each paddock contains only the one soil type. Thus, on a farm with both alluvial flats and hilly slopes, a paddock should not include both, for they normally differ in their fertility and

cropping possibilities. Likewise, if either the alluvial flats or the hillsides consist of more than one soil type, each should be farmed independently from the other if at all practicable. Thus, should an alluvial flat consist of an area of fertile heavy soil originally under red gums (often called blue gums) and an area of less fertile hard clay or clay loam originally under box trees, the two areas should not be enclosed in the one paddock, for they require different cultural and cropping practices.

It is also necessary to ensure that the farm programme will provide for the ploughing of pastures when their productivity falls to low levels, and that the cultivated ground be not cropped until the top soils fail to permit the easy penetration of storm rains.

A cropping programme which meets these requirements is essential on every dairy-cotton farm in this State. Many districts have been opened for closer settlement since 1920 and originally consisted of either open forest or scrub covered country. The forest country was mostly well covered with native grasses noted for their food value and palatability. Considerable areas of scrub country were rapidly brought under Rhodes grass by felling and burning the timber, planting cotton in the ashes, and then sowing the Rhodes grass towards the end of the cotton crop. The resultant pastures originally had a high carrying capacity and the yields obtained from dairying on them tended to divert attention from cultivated crops. The need for such crops is now apparent on many farms where, as a result of heavy stocking, the valuable native grasses have been replaced by more vigorous species of lesser food value and carrying capacity. Rhodes grass pastures similarly have lost much of their earlier productivity, and weeds have become troublesome. At the same time, deterioration in the older areas under permanent cultivation has occurred through either soil erosion or a change in soil structure which lessens its capacity to absorb and hold rain.

Investigations conducted at the Biloela Research Station and on farms in cotton-growing districts have shown that if worn out pastures are ploughed and planted with cotton for three successive seasons, a Rhodes grass pasture can be re-established and depended on for three seasons' good growth. It has also been ascertained that ploughed pasture land makes better use of rainfall than old cultivations on the same soil type and that storm rains occurring when crops are growing, penetrate deeper in the newer cultivations, particularly in row crops and on sloping country. These factors are of the utmost importance for much of the summer rainfall is of the thunderstorm type wherein two or more inches of rain fall in a few hours. In old cultivations on relatively level clay loam to clay alluvial soils, such rains may not penetrate more than 5 inches in mid-season if the tillage operations have ceased and the surface of the soil has caked. In the more permeable first or second year of cultivation following the ploughing of grassland, such rainfall penetrates to a much greater depth. This increased penetration of rainfall into the clay loam and clay soils which are the dominant types in these districts, is highly desirable and can be obtained by the inclusion of a Rhodes grass pasture for three years in the rotations practised on all cultivated areas. As periods of water stress of varying intensity are frequently experienced by most crops grown on old cultivations in these districts, the improvement of the permeability of the soils through including Rhodes grass pastures in the rotations, with the resultant increased penetration of rainfall, is obviously desirable.

When pastures are ploughed, the balance of plant foods in the soil is favourable to crops such as cotton which do not require large amounts of nitrogen. On the other hand, fodder crops may not grow well on soils of only medium fertility during the first year of cultivation after a long established Rhodes grass pasture, and it is advisable, therefore, to grow cotton at this stage in the rotation. The cultural operations required to grow this crop make available sufficient nitrogen for satisfactory growth in the following fodder crops. Conversely, if fodder crops are grown for a few years after the cotton crop, it may be necessary prior to re-establishing Rhodes grass, either to grow an early-planted crop of cowpeas for grazing off by mid-summer or to leave the land in a rough fallow during the spring and early summer. Either procedure will increase the nitrogen content of the soil sufficiently to promote a substantially better growth of Rhodes grass than would be the case if the grass was sown directly after a fodder crop such as sorghum, oats, or wheat.

Summary.

The decline in the productivity of both pastures and old cultivations on dairy-cotton farms in districts receiving an average annual rainfall of less than 30 inches, makes it highly desirable that farmers should consider suitable remedial measures. Generally speaking, failure to practise suitable rotations has been the cause of reduced yields from both pastures and cultivated crops. The productivity of pastures can be greatly improved by ploughing them out, growing cotton for one to three years according to the fertility of the soil, and then establishing Rhodes grass for at least three years.

Investigations have also demonstrated that cotton crops yield particularly well during the first three seasons following grassland. There is a better balance of plant foods required by the cotton crop and the surface soil is kept more permeable with such a rotation than is the case where the land is cropped for long periods. The improved permeability of the surface soils permits better rainfall penetration than occurs in old cultivations, particularly heavy clay loams and clays, thereby providing more subsoil moisture for the crops.

It is advisable too, to incorporate Rhodes grass in rotations including summer and winter growing fodder and grain crops. There may be insufficient nitrogen for these crops, however, in the first year after Rhodes grass. Cotton should therefore be the first crop planted after the pasture is ploughed as the cultural operations in this crop stimulate the production of sufficient nitrogen for the following fodder crops.

Where Rhodes grass is to be established on land that has been cropped to cereals or sorghums for some years, an early planted cowpea crop for grazing or several months' cultivated fallow should precede the establishment of the Rhodes grass, to provide sufficient nitrogen to promote a satisfactory growth of the pasture.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to the Department of Agriculture and Stock, Brisbane, without delay.



Passion Fruit in the Tropics.

W. G. HANCOCK.

THE ordinary purple passion fruit, *Passiflora edulis*, is usually planted against a fence-type trellis, as is the normal method in cooler latitudes. However, vines planted this way seldom live long and usually succumb to bark injury close to the ground, and passion fruit culture is generally voted a failure.

In the same locality, however, a stray vine growing along the edge of some scrub may flourish year after year. Observations tend to show that passion vine stems are easily injured by heat, and the feeding roots are shallow and killed by hot surface soil. These conditions exist when the vine is grown on a vertical trellis, for the sun strikes the base of the stem and heats up the soil around it. In the case of a vine growing in the scrub the stem is shaded by vegetation and the roots are in a cool moist soil; only the foliage coming into the sunlight.

If these conditions are copied and passion vines grown over a pergola in a similar manner to granadillas, so that the plants are set in the centre of the shaded area, they will flourish and bear for several years.

The young plants are shaded and trained up a stake to reach the top of the pergola, over which they clamber, thereby shading the stems and ground underneath. Vines should have sufficient water in dry weather and cultivation should not be deep or too frequent over the root area.

WHEN WATER IS LIMITED.

For small fruit trees and shrubs in dry districts where water supplies are short, the maximum value from the few gallons available is obtained by sinking one or more punctured kerosene tins in the ground a few feet from each tree or shrub. If these are occasionally filled with water the whole of it will percolate amongst the roots; whereas the same amount applied to the surface would be evaporated and wasted. At the best the latter practice only encourages shallow rooting, which further aggravates drought conditions, while the former encourages deep rooting.

In the home vegetable and flower garden likewise, 2-lb. jam tins set amongst the plants will make a gallon or two of water go a very long way.

—W. G. HANCOCK.

WARTIME FOOD PRODUCTION

The following notes are taken from the current Newsletter issued by the Department of Agriculture and Stock to District War Agricultural Committees.

Dairy Production in Queensland.

Although butter and cheese production for 1943-44 was not so very far below the goal set for Queensland, it was realized in all quarters that had a normal dry winter been experienced, butter and milk supplies would have been rationed much more severely than was actually necessary.

In reviewing the causes for lowered production and examining means by which output may be raised, some interesting facts have been brought to light. It was estimated that 2,000 farmers had gone out of dairy production. The main decline in numbers occurred in 1941-42, when the figures represented twice the number in the next two years, insofar as people leaving the industry were concerned.

Although the total number of dairy cows fell by only 40,000 (1½ per cent.) from 1941 to 1943, the total number being milked apparently declined by 250,000 (10 per cent.). It appears conclusive that farmers are milking fewer cows and a smaller proportion of their herds. It is also obvious that cows are not being milked to the full period of their lactation. The inference to be drawn is that labour is not available to do normal duty as milkers.

In summarizing the causes for the falling off of Commonwealth production of 17 per cent., a Commonwealth authority attributes 10 per cent. to shortage on farms still in dairying, 3·4 per cent. to farms on which dairy production has been discontinued, and 3·4 per cent. to fodder shortage and other wartime difficulties.

The following figures indicate how production of butter and cheese in Queensland has varied since the commencement of the war:—

Year	Butter Tons	Cheese Tons	Total Milk Equiv. in Galls.
1939-40	62,000	6,000	291·2 million
1940-41	52,000	5,000	244·2 ..
1941-42	42,000	7,000	203·2 ..
1942-43	49,781	12,669	251·4 ..
1943-44	45,300*	10,799*	227·1 ..

* Estimated.

These figures show a reduction in butter production of 13 per cent. between 1940-41 and 1943-44, but there is an increase of 54 per cent. in cheese production, while the milk equivalent of the two commodities combined has fallen 7.5 per cent.

The consumption of whole milk is not accounted for in these considerations, and, although it is not possible to obtain accurate figures, it seems fairly certain that while civilian consumption has been reduced the extra demands by the Services during the last three years would result in more milk being devoted to whole milk supply during 1943-44 than was the case in 1940-41.

Although it may be considered that dairy production in Queensland is being maintained at a moderately satisfactory level, it should be borne in mind that there has been a very considerably increased demand for butter, cheese, and milk. In addition to Australian Forces located in and near this State, there are Allied Forces, both Army and Navy, together with the heavy influx of A.W.C. personnel, to be supplied. Butter produced in 1943-44 was 11 per cent. below the goal and cheese showed a 30 per cent. reduction.

The reasons for failure to reach the required objectives are many, but most stress can be placed on labour shortage and seasonal conditions. The 1944-45 goals have not yet been announced, but the probability is that they will at least equal those of last year, so that efforts of all must continue if we are to meet the commitments which have been allotted to us.

MACHINERY.

Government Purchased Machinery.

District War Agricultural Committees are in a position to assist greatly in the Government plan of acquiring additional supplies of agricultural machinery in order to increase food production in this State. Local contacts provide the best source of recommendations of prospective users of equipment. It will therefore be recognised that co-operation in the distribution of all available machinery in such a way as will ensure the greatest benefit to the greatest number of producers is necessary.

Most of the equipment asked for on the first order placed with the Commonwealth Government is now in course of consignment to producers.



Plate 40.
CATTLE ON KINDON, NEAR GOONDIWINDI.

VEGETABLE PRODUCTION

French Beans.

Contributed by the Horticultural Branch.

OF beans grown in Queensland, Canadian Wonder is an all round favourite on the market, but because of its susceptibility to disease is not now grown to the same extent as formerly. Brown Beauty is very popular in all districts and is known as a hardy and prolific variety. Staley's Surprise also is grown fairly extensively and is usually planted two or three weeks earlier than Brown Beauty. Other varieties grown to a lesser extent are Feltham's Prolific and Burnley Selection, the latter being a new variety supposedly blight-resistant.

Plantings may be made at almost any time of the year, depending on local conditions in each district. On the North Coast, on areas free from frost, plantings are usual throughout the winter; in other districts spring or summer planting is preferred.

In some parts of Queensland difficulty has been experienced in raising a crop during the warmer months because of bean fly attack, but experiments have shown that it is possible to obtain at least partial control of this pest by spraying with nicotine sulphate and white oil. Information on this and other pests and diseases of beans may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

In preparing land for general market garden crops, along with cultivation they generally require the free use of well-rotted stable or other manure, but in the case of beans the application of heavy dressings of such manures often results in the production of an over-abundance of foliage and poor setting of pods. Beans grow best in a well-cultivated soil, preferably one which has been manured for a preceding crop. Well drained, clayey loams yield the best result.

Fertilizers should be used freely. There are available several commercial complete fertilizers for beans which may be purchased with confidence. The customary dressing is 6 cwt. to the acre. It should be applied in the bottom of the drills and covered with about an inch or two of soil before planting the seed. Planting is usually done in drills about 6 inches deep, and after applying the fertilizer and lightly covering it with soil, dropping the seed by hand and again raking in a light covering of soil. In the course of subsequent cultivation the drills will gradually fill up. The rows may be 2 feet 6 inches to 3 feet apart and the seeds spaced 6 inches to 8 inches in the rows; 35 lb. of small and 52 lb. of large seed is sufficient to plant an acre.

Horse cultivation is usually done, but it is not advisable for this work to be commenced in the early morning or at any time when the plants are wet, as the spores of certain diseases are more easily carried under these conditions. Weeds should be kept in check, as they will seriously affect the growth of the crop.

The maximum output of beans can only be gained by picking thoroughly as they become fit—that is, when young and tender; otherwise they will begin to form seed, and the plants will cease to bear marketable beans.

Vegetable Planting Tables.

VEGETABLES may be divided into two main classes—surface vegetables and root vegetables. Surface vegetables are cabbage, cauliflower, lettuce, beans, peas, and all those other plants which grow the edible portion above ground. The term root vegetables applies to carrots, turnips, beetroots, potatoes, and other plants of which the roots are the edible part.

In a vegetable garden it is a good plan to rotate these two classes—i.e., grow a root crop in the bed which has just produced a surface crop and, *vice versa*, grow a surface crop in a bed which has just produced a root crop. Briefly, the reason is that surface crops feed heavily on certain plant foods in the soil, and root crops feed heavily on other kinds of plant foods. If rotation of the two classes is practised, the balance of plant food in the soil is maintained. On the other hand, if surface crops are grown continuously, they will gradually become poorer. The same applies to continuous growth of root crops in the same bed.

If the supply of compost is limited and it is only possible to dig some into the garden after every second crop, then, as a general rule, it is advisable to always dig it in before planting the surface crop.

Liquid manure is one of the best means the home gardener has of supplying plant foods to vegetables—particularly surface vegetables—to keep them growing quickly. Where horse, cow, or fowl manure is available, liquid manure may be applied regularly every week. It is very simply made. Any container, such as a kerosene tin or clean oil-drum, may be used and enough fresh manure placed in it to fill it to about one-third of its capacity. It should then be filled up with water and covered with a bag or boards and let stand in the shade for three or four days, when it will be ready to use. About $1\frac{1}{2}$ pints of the liquid should be added to 4 gallons of water—say, three large cupfuls to a kerosene tin—and the mixture then poured on the soil around the plants. The gardener can use his own discretion as to what quantity he gives each plant, but a pint is not too much. It is advisable to apply the liquid manure after watering, as no injury will then be done to tender roots. Care should also be taken not to pour the liquid manure over the plants, as young tender growth may be “burnt.”

On the following pages are vegetable crop planting tables for the three main divisions of the State, which may be regarded as a general guide to the ordinary grower:—

When to Grow Vegetables. SOUTHERN QUEENSLAND.

Crop.	When to Sow or Plant.		Approximate Period of Growth of Crop in Months.	How to Sow or Plant.		
	Coastal Districts.	Inland and Tableland Districts.		Distance Rows should be apart.	Distance Plants should be apart.	Depth to Sow Seeds in the Soil.
Bean	3 months ..	15 inches	6 inches	1 to 2 inches
Beetroot	3 to 4 months	15 inches	4 inches	$\frac{1}{2}$ to 1 inch
Cabbage	3 to 4 months	18 inches	18 inches	$\frac{1}{2}$ inch
Cauliflower	4 to 5 months	18 inches	18 inches	$\frac{1}{2}$ inch
Carrot	4 to 5 months	15 inches	3 to 4 inches	$\frac{1}{2}$ to 1 inch
Choco	6 months ..	4 feet	2 feet	2 inches
Lettuce	2 months ..	15 inches	12 inches	$\frac{1}{2}$ inch
Parsnip	6 months ..	12 inches	4 to 5 inches	$\frac{1}{2}$ inch
Potato (English)	3 to 4 months	18 inches	12 inches	5 inches
Potato (Sweet)	3 to 4 months	3 feet	15 inches	Plant cuttings
Pumpkin and Marrow	5 to 6 months	6 feet	3 feet	1 to 2 inches
Pea	3½ months ..	15 inches	6 inches	1 to 2 inches
Radish	1 month ..	12 inches	2 inches	$\frac{1}{2}$ to 1 inch
Silver Beet	1½ to 2 months	15 inches	15 inches	1 inch
Tomato	3 to 4 months	On stakes 2 feet 6 inches	18 inches	$\frac{1}{2}$ to 1 inch
Turnip	2 to 3 months	15 inches	5 inches	1 inch
Turnip (Swede)	4 months ..	15 inches	9 inches	1 inch

CENTRAL QUEENSLAND.

Crop.	When to Sow or Plant.		Approximate Period of Growth of Crop in Months.	How to Sow or Plant.		
	Coastal Districts.	Inland and Tableland Districts.		Distance Rows should be apart.	Distance Plants should be apart.	Depth to Sow Seeds in the Soil.
Bean	September to January	3 months ..	15 inches	6 inches	1 to 2 inches
Beetroot	February to August	3 to 4 months	15 inches	4 inches	1 to 1 inch
Cabbage	February to June	3 to 4 months	18 inches	18 inches	1 to 1 inch
Cauliflower	February to May	4 to 5 months	18 inches	18 inches	1 to 1 inch
Carrot	March to June	4 to 5 months	15 inches	3 to 4 inches	1 to 1 inch
Choco	July to November	6 months ..	4 feet	2 feet	2 inches
Lettuce	March to September	2 months ..	15 inches	12 inches	1 to 1 inch
Parsnip	March and April	6 months ..	12 inches	4 to 5 inches	1 to 1 inch
Potato (English)	July and February	3 to 4 months	18 inches	12 inches	1 to 1 inch
Potato (Sweet)	August to December	3 to 4 months	3 feet	15 inches	Plant cuttings
Pumpkin and Marrow	September to November	5 to 6 months	6 feet	3 feet	1 to 2 inches
Pea	April to June	3½ months ..	15 inches	6 inches	1 to 2 inches
Radish	All seasons	1 month ..	12 inches	2 inches	1 to 1 inch
Silver Beet	All seasons	1½ to 2 months	15 inches	15 inches	1 to 1 inch
Tomato	August to December	3 to 4 months	On stakes 2 feet 6 inches	18 inches	1 to 1 inch
Turnip	March to June	2 to 3 months	15 inches	5 inches	1 inch
Turnip (Swede)	March to June	4 months ..	15 inches	9 inches	1 inch

NORTHERN QUEENSLAND.

Crop.	When to Sow or Plant.		Approximate Period of Growth of Crop in Months.	How to Sow or Plant.		
	Coastal Districts.	Tableland Districts.		Distance Rows should be apart.	Distance Plants should be apart.	Depth to Sow Seeds in the Soil.
Bean ..	April to August ..	August to April ..	3 months ..	15 inches ..	6 inches ..	1 to 2 inches
Beetroot ..	March to August ..	February to September ..	3 to 4 months ..	15 inches ..	4 inches ..	1 to 1 inch
Cabbage ..	February to July ..	January to August ..	3 to 4 months ..	18 inches ..	18 inches ..	1 inch
Cauliflower ..	April to May ..	January to May ..	4 to 5 months ..	18 inches ..	18 inches ..	1 inch
Carrot ..	February to October ..	February to October ..	4 to 5 months ..	15 inches ..	3 to 4 inches ..	1 to 1 inch
Choco ..	July to October ..	August to April ..	5 to 6 months ..	4 feet ..	2 feet ..	2 inches
Lettuce ..	March to August ..	March to September ..	2 months ..	15 inches ..	12 inches ..	1 inch
Parsnip ..	February to April ..	January to April ..	5 to 6 months ..	12 inches ..	4 to 5 inches ..	1 inch
Potato (English) ..	March to June ..	{ October, November, December, February, and March ..	3 to 4 months ..	18 inches ..	12 inches ..	5 inches
Potato (Sweet) ..	August to March ..	October to February ..	3 to 4 months ..	3 feet ..	15 inches ..	Cuttings
Pumpkin and Marrow ..	March and April and from August to November ..	November to February ..	5 to 6 months ..	6 feet ..	3 feet ..	1 to 2 inches
Pea ..	March to May ..	February to June ..	3½ months ..	15 inches ..	6 inches ..	1 to 2 inches
Radish ..	All seasons ..	All seasons ..	1 month ..	12 inches ..	2 inches ..	1 to 1 inch
Silver Beet ..	March to August ..	February to September ..	1½ to 2 months ..	15 inches ..	15 inches ..	1 inch
Tomato ..	February to July ..	November to July ..	3 to 4 months ..	On stakes 2 feet 6 inches ..	18 inches ..	1 to 1 inch
Turnip ..	April to June ..	February to May ..	2 to 3 months ..	15 inches ..	5 inches ..	1 inch
Turnip (Swede) ..	March to May ..	February to May ..	4 months ..	15 inches ..	9 inches ..	1 inch

APPLIED BOTANY

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

Red Cotton or Milky Cotton Bush.

D.C.V. (Kuranda)—

The specimen forwarded is the Red Cotton or Milky Cotton Bush (*Asclepias curassavica*), a native of the West Indies and tropical America, but now widely spread as a weed in most tropical and sub-tropical countries. It is widely spread in Queensland, but does not seem to be very abundant in any one locality, and mostly grows along creek banks. It has been proved to be poisonous to stock, but they rarely eat it in sufficient quantities to cause trouble.

The plant has been thought of as a source of rubber, but tests by the Chemical Branch of the Department of Agriculture and Stock do not show it to be very promising in this respect. The silky cotton in the pods can be used as a substitute for kapok, but its collection for this purpose would not be payable. It is not suitable for spinning in the same way as ordinary cotton.

Suggestion for Shade Trees in Winton District.

M.J.L. (Winton)—

1. *Albizia Lebbek*, commonly known as acacia throughout the whole of the central and north-west. The plant can be raised from seeds and is fairly fast growing. If there is any trouble in germinating the seed, try it like wattle seed—i.e., put it in a cup, pour hot water on and allow to stand, say, overnight.
2. Kurrajong should do well around Winton.
3. Bottle Tree, both the narrow and broad leaved, are beautiful shade trees. The broad-leaved variety is a feature of the streets and gardens of Barealdine. The shire clerk at Barealdine could probably supply seed.
4. White Cedar should do quite well and makes a good shade.
5. Pepper Tree (*Schinus molle*) is hardy almost anywhere. The broad-leaved variety probably makes a better shade. The Botanic Gardens, Rockhampton, might be able to supply plants.
6. Portuguese Elm (*Celtis sinensis*) is a tree worth trying around Winton.
7. *Bauhinia Hookeri*, the native bauhinia. Both this and *Bauhinia Carronii* make beautiful trees for the West. Plants of the former may be available from the Brisbane City Council, but it is rather a slow grower.

What about gum trees? Some of these, if topped, make beautiful shade, particularly the narrow-leaved ironbark, the citron gum, and river gum.

Small Passion Vine.

J.M.J. (Annerley)—

The specimen is the small passion vine (*Passiflora minima*). This is a very common tropical weed widely spread in Queensland. The ripe berries would be quite harmless, but the green berries of nearly all passion fruits should be looked on with suspicion.

Caustic Vine and Caustic Weed.

J.P.K. (Barcaldine)—

The large specimen of leafless vine or creeping plant is the Caustic Vine (*Sarcostemma australe*), a plant spread very widely over Australia. It is generally regarded as very poisonous to stock, but at times has been spoken of as quite a good fodder. There is, however, no question of the poisonous nature of the plant. Feeding experiments have definitely shown the plant to be poisonous to all classes of stock. The animals become restless, there is salivation, champing of the jaws and they go down. Bloat and vomiting sometimes occur. There are spasms from time to time. The pupil of the eye becomes dilated. There are paddling movements of the limbs and death occurs in from 12 to 24 hours.

The plant with very small leaves and inclined to creep over the ground is *Euphorbia Drummondii*, the Caustic Weed. This plant also is spread very widely in Australia. In New South Wales it has been shown to contain large quantities of a prussic acid yielding glucoside and to be capable of causing death in a very short time. Repeated tests in Queensland have always yielded negative results and the symptoms as described by experienced stockmen are not those of prussic acid poisoning. The head and neck of affected animals swell considerably. If this swelling is pierced an amber coloured fluid exudes and the life of the sheep may be saved. These symptoms were produced in Western Australia in rats fed on small quantities of the plant. It has also been spoken of as a fodder plant and the probability is that ordinary paddock resting stock are little affected by it. That at least has been the experience in Queensland. Most of the trouble has been in travelling or freshly untrucked stock, particularly sheep. Empty or undernourished animals are, of course, always more liable to poisoning by these plants than those in better condition.

Trees as Windbreaks.

L.C.S. (Numinbah Valley, Nerang)—

As a windbreak, probably the Cypress Pines are the best, but unfortunately under Queensland conditions many of the species are inclined to die out, leaving serious gaps in the hedge or windbreak. The best and least likely to die out in Queensland is *Cupressus Lambertiana*. This is obtainable from most nurserymen.

In the larger type of tree, probably the biggest varieties of Fig Tree are the best. The Moreton Bay, Small-leaved Moreton Bay and the Weeping Fig are all good. The Camphor Laurel also is a good windbreak. Plants of all these may generally be obtained through the ordinary nursery channels. A tree often planted at the seaside and which stands the wind well is the Pongamia Tree; another is Cupania.

Of the native Cypress Pines the Sand Cypress (*Callitris arcuosa*) is an excellent tree and is not confined to sandy situations.

Gums sometimes make good shade belts and shelter trees and can quite frequently be transplanted direct from the forest. The Flooded Gum is one of the best, provided the land is rich enough for it.

Lippia Grass.

E.G.W. (Pittsworth)—

The plant is *Lippia nodiflora*, sometimes called Lippia grass. It is, of course, a herb, not a true grass. It was surprising to receive it from near Pittsworth, as it mostly occurs in seaside places on sandy soils, or on country subject to inundation with salt water. It is widely spread over the warm temperature regions of the world and in America is said to be valuable as a binder for river banks. In some places where it is difficult to get grass to grow, it is recommended as a lawn plant. It is hard to say how it came on to the Downs; probably with seed of couch grass collected in some coastal locality.

Wild Nutmeg.

J.E.L. (Proserpine)—

The specimen is the wild nutmeg (*Myristica insipida*). It may be used as a substitute for ordinary nutmeg, although it is not so strong. The seed is softer than the commercial nutmeg.

PLANT PROTECTION

Fruit-sucking Moths.

J. A. WEDDELL, Research Officer.

SEVERAL species of rather large moths (Plate 41) cause considerable damage to various commercial fruits by piercing the skin and sucking the juice from the ripening fruit. The mouth parts of these moths form a pointed and somewhat serrated proboscis which can be inserted into fruits with even a relatively hard rind. The greatest losses occur in citrus (other than lemons), but the banana, custard apple, grape, mango, papaw, peach, persimmon, pineapple, and tomato may also be attacked. Although sucking moth activity is particularly prevalent in coastal areas, outbreaks are also recorded occasionally from orchards in inland districts.



Plate 41.

FRUIT-SUCKING MOTHS.—Adult male: Note the kidney-shaped spot in the hind wing.

The typical injury in ripening oranges is initially a simple puncture which may not be apparent unless the fruit is squeezed to force drops of juice through the hole in the rind. Later, following the entry of secondary rots, a brown, roughly circular area surrounds each puncture. A single fruit may be pierced several times. Injured fruit tends to ripen prematurely and soon falls to the ground. In fruits such as custard apple, mango, and papaw the entry of rot organisms through the sucking moth punctures causes particularly rapid decay. Green citrus fruits of early varieties may be attacked if the local moth population is high and if there is little alternative feeding material available. Normally, however, the moths are attracted to ripening fruit, and, in the early stages of an outbreak, any fruit fly stung fruit which ripens prematurely is repeatedly attacked.

In addition to the moths which pierce the skin of the fruit there are many others that visit already pierced fruit and feed on the juice which exudes from it. These insects do not cause any new injury or initiate any damage and are therefore of no economic importance.

Small beetles, generally referred to as fruit beetles, enter the punctures shortly after the fruit has been injured by the moths and growers sometimes regard these insects as the primary pest. The commonest of these fruit beetles* is a small, dark-brownish insect, one-eighth of an inch in length and more or less oval in outline. It lays its eggs in the fermenting tissues inside the puncture and the small, yellowish larvæ that hatch from these eggs burrow into and through the fruit. In spite of all appearances to the contrary, these beetles are purely secondary and do not cause any damage to unblemished fruit.

Life History and Habits.

One of the more important fruit-sucking moths† lays its eggs in the spring on the foliage of certain vines‡ that commonly grow in coastal rain forests, along creek banks, and sometimes in open forest country. The vines are usually vigorous climbers and some of them may reach far into the crowns of well grown trees. The leaves vary in shape in the different species from roughly heart-shaped to oval.

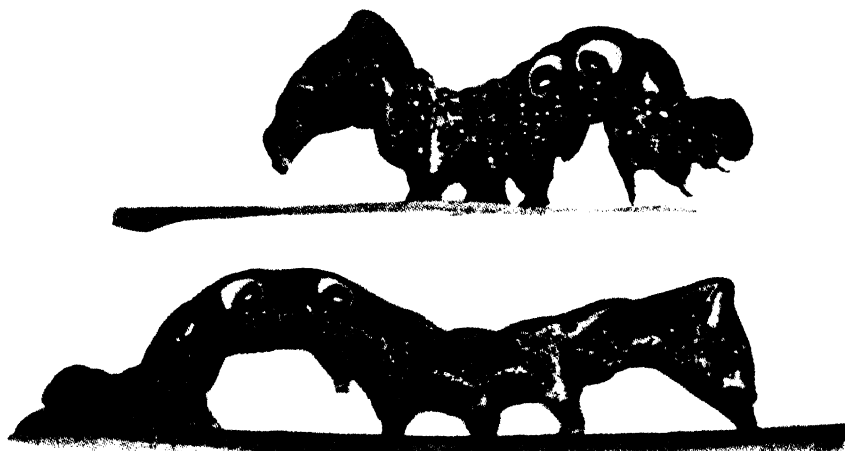


Plate 42.

FRUIT-SUCKING MOTH.—Caterpillars in retracted and extended positions. Note the eye spots and hump.

The caterpillars hatching from the eggs feed on the leaves of the vines and in about three weeks are full grown. At this stage the large caterpillar (Plate 42) is vividly coloured, about 2½ inches in length, a quarter of an inch through the body, and has a pronounced hump towards the rear end. The colour is predominantly a rich, velvety black, speckled with brown, yellow, and white; odd individuals are brown rather than black. On each side of the body, just behind the segments bearing the true legs, are two large spots, often called eye spots because of their general resemblance to eyes. The caterpillars rather characteristically rest on the plant with an upwardly projecting loop to the body and, if disturbed, they twist and turn before falling to the ground.

* *Carpophilus hemipterus* Linn.

† *Ophideres fullonica* Linn. Other species commonly implicated include *O. materna* Linn. and *O. salamina* Fabr.

‡ These belong to the botanical family *Menispermaceae*.

The full-grown caterpillar webs adjacent leaves of the vines together to form a loose shelter (Plate 43, fig. 1) within which it transforms to a rather stout, dark-brown to purplish coloured pupa (Plate 43, fig. 2), $1\frac{1}{4}$ inches long and about four-tenths of an inch broad.



Plate 43.

FRUIT-SUCKING MOTH: Fig. 1.—Webbed leaves of vine in which pupation takes place. Fig. 2.—Pupa.

The adult moth emerges from the pupa about three weeks later. The female moth is large and stout bodied, the body length being about $1\frac{1}{4}$ inches and the wing spread 4 inches. The forewings may vary from dark-green to greenish-brown, with an intricate, greyish, mottled pattern. The hind wings have a broad, dark-brown band on the front and outer margins, the latter being tipped with six white spots; the inner portion of the wing is orange-yellow with a large, kidney-shaped, brown spot. The male (Plate 41) is very similar except that it is slightly smaller and the forewing has a dull pattern consisting of two khaki-brown portions separated by a slightly lighter brown band.

The moths are strong fliers and they may be found in inland orchards far from any known areas in which their larval food plants grow. They normally shelter by day in timbered country adjacent to the orchard which is visited each night from dusk onwards when feeding takes place. The moths are not strongly attracted to lights.

Moths may be found from November until May in Southern Queensland, but the semi-dormant period in winter is shorter further north where the moth is active for a longer time.

From season to season considerable variation in sucking moth incidence occurs and this may be explained in several ways. If good rains fall in early spring, the vine growth in late spring and early summer is prolific. Ample food supplies are then available for larval development and moth populations rapidly increase. A limiting factor

to such an increase in the number of moths on the wing, however, is the activity of certain wasp parasites that attack and destroy the caterpillars. The interaction of factors such as these affords some explanation of the sporadic nature of fruit-sucking moth outbreaks.

Control.

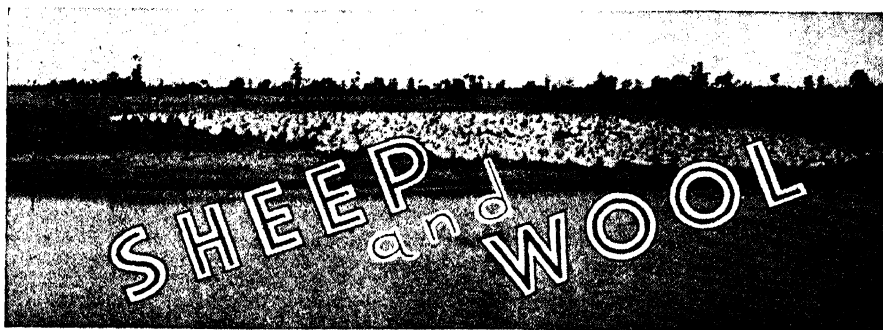
It may be thought that the control of this type of pest could be achieved by the elimination of the vines on which it breeds. In practice this is not feasible, for these vines are widespread, and in any case their destruction near an orchard would do little to prevent invasions by the strong flying moths from breeding grounds further away. The only known method of control is the direct destruction of the adult moths in the orchard, and even this is not altogether satisfactory.

Several "common-sense" methods of control can be applied, but, in all, it is essential that the work should begin some weeks before the fruit is expected to ripen on the tree, and control measures should be continued for as long as moths are caught in any numbers.

Trees in the orchard should be examined by the grower each evening with the aid of a torch or lamp. Moths, when feeding, are not readily disturbed and can be easily captured or swatted on the fruit. Trees with ripening fruit should receive particular attention. After a few visits to the orchard it may be found that the moths have a particular preference for certain trees and attention can then be concentrated on these trees.

Sucking moths are particularly attracted to ripe and over-ripe bananas, hence, if these are readily available, bundles of five or six ripe fruit may be tied with string or wrapped in open weave calico and hung as lures in the trees. On the nightly examination any moths that have been attracted can be destroyed.

Fallen, prematurely ripened, fruit in the orchard could also be gathered into small piles to attract the moths, were it not for the risk that any fruit fly larvæ in it would survive and complete their development. Any such fruit should normally be gathered regularly and destroyed as part of the ordinary fruit fly control programme. However, if bananas are not available for making the lures, fallen fruit may be used if the precaution is first taken carefully to sort out and destroy any which show fruit fly stings. The remaining sound fruit may then be either distributed in small piles on the ground throughout the orchard or, alternatively, wrapped in open weave calico, and hung in the orchard as lures. All of the fruit lures need to be examined each night and also renewed every three days. Fruit discarded from the lures should be destroyed immediately in case new fruit fly infestation has occurred. Some growers also use improvised traps made from hessian bags, the mouth of each bag being braced open by strong wire. The bag is suspended upside down with the fruit lure hung in the mouth. After feeding on the fruit the moths tend to move upwards into the bag at dawn, and they may be killed first thing each morning. If the moths clearly show a preference for certain trees, then lures or traps should be concentrated mainly in the vicinity of those trees.



The Sheep and Wool Industry in Queensland.

ALTHOUGH every branch of sheep husbandry is practised in Queensland, wool production is the predominant interest of the pastoral industry. The western districts of the State are particularly adapted to the production of fine wools, and that is the principal reason why over 98 per cent. of present-day appraisals are made up of merino fleeces. With vast stretches of natural pastoral country extending from the New South Wales border to north of Cloncurry, climatic and local environmental conditions have naturally a wide variation, but on these thousands of square miles of largely open, rolling downs and plain country the general conditions are peculiarly suitable for pastoral purposes on a large scale.

Climate and Rainfall.

Queensland has, roughly, three climatic regions: the coast and adjacent mountain slopes with average annual rainfalls varying from 40 to 180 inches, the latter being for the coastal country between Cardwell and Cairns which is the heaviest rainfall region in Australia; the mid-interior where rainfall averages range from 15 to 25 inches; and the far-interior where the average rainfall is mostly below 10 inches and the rate of evaporation high. The main wool-growing districts are situated in the mid-western and western divisions of the State. Most of these territories is held under lease from the Crown.

Distribution of Flocks.

Flocks are few in the regions of higher rainfall where they are usually run as a farmer's sideline as mutton sheep, and in which Romney Marsh blood predominates.

West of the Main Dividing Range, on many well improved properties in the eastern section, fat lamb-raising is combined largely with wheat growing. Sheep also are often included in diversified farming enterprises. In this region also are established registered sheep studs of British breeds to supply foundation lamb-raising flocks, as well as to provide new blood for established flocks. Merino stud flocks also have been established here, but not to the same extent as in the country further west. Stud sheep breeding, both for wool and mutton production, is on the upward grade.

In the lamb raising regions, both summer and winter crops are grown successfully and are used for topping up fully 95 per cent. of the crossbred lambs which go through the Cannon Hill saleyards, near Brisbane, as prime suckers for export.

The agricultural areas, however, are rather limited in extent, as compared with the vast tracts of good pastoral land extending further westwards and northwards and which is gradually being improved for increased production. This process is obviously slow, especially in present circumstances and under existing conditions, but eventually many flourishing flocks of various breeds and their crosses will have been established. Even now, in these districts there are many crossbred flocks with both British longwool and Corriedale foundations.

The Corriedale breed particularly show to advantage in the near-to mid-western region, as conditions generally are suitable for its development both as a mutton and wool producer. The best of this country is that which was formerly timbered densely with brigalow and belah "scrub" and, until recent years, carried an almost impenetrable covering of prickly-pear. The coming of the cactoblastis caterpillar proved a veritable godsend to landholders, and to that insect a memorial community hall has been erected at Boonarga in gratitude for deliverance from one of the worst pests ever imported into this country.

In Western Queensland proper is the purely pastoral country which has contributed so greatly to Australia's wool producing reputation. It consists mostly of undulating, well-grassed, lightly timbered pastoral country which, in a good season, is impressive in its obvious opulence. In normal years, the wet season is in the summer and is usually preceded by a series of thunderstorms occurring sometimes as early as October. The winters, with days of brilliant sunshine and frosty nights are, climatically, superb.

Practically the whole of the country west of the Dividing Highback is situated in the world's largest artesian basin, which does not include, however, the high lands just south and west of Cloncurry. The artesian water varies in quality, but its use has made productive huge areas that otherwise would be too dry for continuous pastoral occupation. The pastoral country of Queensland is as large as Western Europe.

Sheep Breeding in Queensland.

Breeding is practised so generally on most of the pastoral country that flock replacement is constant, ewe lambs being retained for breeding and wethers made available for sale as woolgrowers to pastoralists who find it more economical to buy sheep than to rear them, because of the nature of their country, which includes the treeless plains of the West and of other local conditions. Although large areas of Western Queensland may be regarded generally as of light stock carrying capacity, the sheep are usually big and carry a heavier fleece than similar sheep running on the richer pastures further east. These environmental characteristics have induced many merino breeders to go in for stud breeding and, as a consequence, membership of the Queensland Stud Breeding Association is increasing. The number of sheep qualified for registration also is increasing, and the beneficial influence of better sires is already showing in their progeny. This general improvement in flock standards has led to the holding of sheep and wool shows in many pastoral centres. The quality of the exhibits at these

shows would merit their entrance as probable prize winners at any of the bigger merino exhibitions, and has stimulated keen competition among the breeders. Naturally, this increase in the number of high-quality sheep is having a valuable influence on the industry generally, and on neighbouring pastoral holdings particularly.

Flock Classing.

The importance of classing the breeding flock is becoming more widely recognised. The first result of this practice, of course, is in heavier and denser fleeces, while classing for conformation leads to evenness of type and covering and, consequently, a better clip and a more desirable carcase.

Queensland pastoral areas are now fully stocked, while last season's wool clip approached closely to that of the peak year (1942-43) production which returned to the growers a little over £14 millions.

Preparation of the Clip for Market.

J. L. HODGE, Instructor in Sheep and Wool.

PREPARATION for shearing on a property of any considerable size calls for much thought, and the necessary action, before the actual shearing commences. Too often this is left to the last minute, with consequent worry and bustle and hustle at the commencement of operations.

Owners would be well advised to take early action in the following details of good management, to mention only some of the many which demand attention even on the best equipped properties:—An inspection of the shed itself is bound to reveal something which should be done for its efficient working. Machinery should be overhauled, and handpieces put in order. The catching pens should be put in proper repair, a rail out here and a rail wanted there. Pen gates should be properly hung to allow the shearer quick ingress and egress. Down chutes nearly always call for repairs, mainly because of their exposed position. Counting-out pens and gates are subjected to some pressure, and therefore are bound to be in want of attention. The branding race should be in first rate order and some repairs are usually required.

In the shed, loose battens may be found and these should be firmly fixed to save injury to the sheep. The wool press may want an overhaul. New ropes may be necessary and these should be fixed well before starting time. Wool packs should be opened and placed handy to the press. Bale fasteners should be in place. Wool tables may want repair, a loose leg here or a broken batten there. The same applies to wool bins.

On the shearing board, the containers for the dressing to be used on cuts should be filled and placed in handy situations. Brooms should be in place. The engine should be given a trial run.

The observance of all these details makes for a smooth start, and it very often follows that a smooth start means a smooth run right through the shearing.

Order of Shearing.

The order of shearing is generally determined by some point in conjunction with the management of the property. It may be that a

certain paddock is wanted for shorn sheep, therefore it becomes necessary to muster that particular paddock, and, of course, shear the sheep while in hand. A lot of rams may be in the way, and it is desired to get them out; in that case, the rams would be shorn first. Possibly there are ewes with long-tailed lambs in the flock, and it may be desired to mark these lambs while in hand. In that case, the ewes would be shorn last, when all other sheep are out of the way and the yards are free.

Enough has been said to indicate that the order of shearing is important. Proper choice in the order of shearing saves muddle during the whole busy period. It is well to have some fairly accurate idea of the number of sheep the shearing team is capable of turning out in the day—this with the idea of yarding and shedding only a little over the necessary number for a day's run. It is not right to keep sheep in the yards for two days and sometimes longer. As evidence of lack of planning or foresight it jars one's sense of good management.

Sheep should be shedded and penned the night before shearing is to commence, and it should be the duty of someone in authority to take a careful look round every night to see that sheep are not too "tight." Neglect to do this may, some morning, reveal a number of casualties as the result of crushing and smotherings.

Classing the Clip.

Of first importance is the choice of an experienced classer, for the whole of the "get up" of the clip is in his hands and financial results are dependent upon his efforts. Apart from the actual classing of the fleece portion of the clip, his duties are many and varied. He is in complete charge of the wool room and the workers in it; so everything in the room connected with the clip is his direct responsibility.

Duties of a Classer.—It is the duty of the classer to display the wool honestly, so that the buyer or appraiser has no difficulty in arriving at the true value of the various lines. This applies not only to the fleece lines but to every line right down to the locks.

Locks.—If the shed is big enough, table locks and board locks should be kept separate. The former are those locks which fall under the wool tables in the process of skirting, and the latter are those swept from the shearing board. The difference in price is often appreciable.

Bellies.—All bellies should be skirted. That portion of wool removed brings its value in a lower line, while the improved belly wool line may enhance in value up to $\frac{1}{2}$ d. or even a 1d. per lb. All bellies from male sheep should be "ringed" in addition to skirting. Ringing means the removal of all pizzle pieces.

Stained Pieces.—Stained pieces should always be kept separate. If at all damp, provision should be made for drying the pieces before baling. This may be done by putting up a wire netting rack outside the shed. The stains thus get the benefit of sun overhead and air underneath.

Brokens and Pieces.—Generally speaking, these lines could be better handled, and the work should be done by a competent man. The brokens should be kept as large as practicable with all fatty ends removed. What is not good enough for the brokens obviously goes for the pieces, and here again it is just as necessary to remove all fatty ends.

Fleece Lines.—While a general supervision of the foregoing lines is maintained by the careful classer, the treatment of the fleece lines is directly in his own hands. Dependent on the wool available, the classer will make such lines as his experience and a close study of the market indicate. Particular importance, especially at the present time, should be given to quality, yield, length of staple, and colour.

Quality covers a number of virtues, such as "handle," condition, the dimension of the fibre, and so on.

Yield means the proportion of clean wool left after the removal, by scouring, of all foreign matter, including fat or yolk.

Length of staple is important. Every effort should be made to keep fleece lines as even in length as possible. Even in lines of the same quality there should be no very pronounced difference in length.

Skirting is most important work. There is a tendency for shed hands to remove too much from a fleece of a free nature, and this results in direct loss to the grower inasmuch as every pound of wool removed unnecessarily from the fleece brings in value the price given for the lower grades into which it is eventually placed. With a free line, the operator should be able to give a reason for all wool removed. In a line of wool carrying seed, deep skirting is probably necessary in an endeavour to "free" the fleece. On the other hand, a very seedy line requires light skirting, the fleece portion then being offered as a seedy line.

With appraisement in the disposal of our wools, there has been a distinct tendency on the part of some classers to *overclass* a clip. This is a fault, especially if it entails star lots. The classer should have sufficient confidence in his own work to put together wools of equal value, without, of course, ignoring the rules of good classing.

At the cut out of any particular line of sheep, the classer should, if necessary, insist on a clean up.

Pressing.—Careful pressing is an integral part of the general get of a clip. Bales should be kept as even in size and weight as practicable. Clean cut stencils should be used in the branding of bales. The station brand, the quality of the wool the pack contains, and the number should be clearly indicated. Careful branding goes a long way in indicating the get-up of a clip when the wool is displayed for inspection on the broker's show floor. At the present time, every effort should be made to get as much wool into the pack as possible. Apart from the scarcity of packs and their high price, there is the question of shipping and handling. A great saving all round would be made if growers got even another 10 lb. of wool into every bale.

At the cut out of every flock, it is the duty of the classer to advise his selling broker of the line of wool represented by certain bale numbers, a brief report should also accompany this advice note; this greatly facilitates the handling of the wool on its delivery into store.

With the counting out of each shorn flock, branding usually follows. The brand should be carefully applied in the position allotted on the sheep. No tar materials should be used. A branding fluid should possess two qualities: first, it should remain legible on the sheep during the growth of the twelve months' fleece; and, secondly, it should scour out without any harmful effect to the scouring mixture. Such branding fluids may be purchased from proprietary houses.



Improving the Dairy Herd.

E. B. RICE.

MANY dairy farmers, because of limited capital resources, have had to begin with a herd of "serub" or nondescript animals of low production, but this need not deter them from pursuing a progressive breeding policy which will eventually lead to the possession of a highly improved dairy herd. In fact, anyone who is satisfied to continue with inferior or "serub" stock cannot be expected to find interest in his avocation, or look forward to creating an independence even after long years of hard work. Herd improvement, on the other hand, stimulates interest and leads to progress and financial stability.

Sire Selection.

In the building up or grading up of dairy stock, the sire is of first importance, for he is the foundation upon which dairy progress is made. The choice of any particular breed of bull will naturally depend on factors such as whether the object is milk supply or cream production, the class of country and the individual preference of the farmer. Which-ever breed is decided on, only by following a policy of strict adherence to that breed may a herd of the correct dairy type and higher production be surely developed. A pure-bred sire is, of course, essential, and he should preferably be descended from a dam whose production has entitled her to be included in the advanced register of her breed. The better the production backing of the young bull's maternal and paternal ancestors (particularly of the near ancestors), the more likely will his female offspring be higher producers than their dams.

The lists of records of production of animals submitted to the official pure-bred testing scheme conducted by the Department of Agriculture and Stock, furnish information concerning stock with official records. There is thus a wide range of officially tested cows from which a suitable bull calf may be selected.

Selection of Cows.

As soon as the first crop of heifers from the pure-bred sire come into profit, the gradual replacement of the original inferior cows commences—substituting the heifers for the most inferior mature cows. The use of successive high quality, pure-bred bulls and the constant culling of inferior cows and replacing them with heifers from high-producing stock will materially increase the herd yield within a few years. On reaching this stage, a system of line-breeding, by using sires of a selected blood strain, is followed.

In order to obtain reliable data on productive ability, herd testing should be a corollary of any progressive herd improvement plan. Moreover, once a high class dairy herd has been built up, adequate feeding is essential, if the cows are to be enabled to produce to their maximum inherited capacity. The utilisation of home-grown feeds for this purpose is usually the only economically feasible means in Queensland and this requires the growing of suitable seasonal fodder crops and the conservation of hay and silage for supplementing the food obtainable from the grazing of pastures during the drier months.

Summary.

1. Purchase a pure-bred bull, of proved production ancestry.
2. Cull cows according to production.
3. Join the free herd-testing services conducted by the Department of Agriculture and Stock to obtain accurate records of cows' productive capacity.
4. Provide adequate fodder reserves to tide over periods of pasture scarcity.

Cottage Cheese.

W. J. PARK.

ALTHOUGH cottage cheese has been made in small batches on dairy farms for many years, it is only during the last twelve months that it has been manufactured on a commercial scale. All experimental work was done at the Pittsworth Cheese Factory by Mr. R. Duncan, and to him goes the credit for producing an article of sound keeping quality and suitable for the particular trade for which it was manufactured.

Early attempts to manufacture cottage cheese in Queensland were along lines laid down by standard text books on the subject from overseas countries, but the resultant product was unsuitable for the trade. This necessitated lengthy experiments before a suitable article was produced, and brought forward a number of wide variations from the usual methods. It was found that the process of manufacture could vary from day to day, and to extremes unknown in normal cheddar cheese manufacture. The individual skill of the operator is of prime importance, and he must know the exact procedure to adopt to produce the type of cheese required. This knowledge can only be gained from experience and from a careful study of temperature, body and texture and acidities.

Before dealing with the process of cottage cheese-making in Queensland, a brief resume of the process as adopted in America will be given to show the wide variations between the two countries.

The Conventional American Process.

Cottage cheese is made from skim milk which is pasteurised either by the batch (145° for 30 minutes), or flash (156-160° F.) method. The milk is then cooled to 70° F. and approximately 5 per cent. starter added. The ripening is allowed to proceed for 12-15 hours until the acidity reaches .75 per cent. to .90 per cent. with a firm, uniform coagulation. The curd is then cut with curd knives (the blades set $\frac{1}{2}$ inch apart) and 10 per cent. of water added at from 100-105° F. This starts to firm the curd and the batch is stirred with hand rakes while the temperature is raised to 110°-125° F., the cooking process taking from 35-50 minutes. The whey is drawn or syphoned off as soon as the curd has reached the desired stage of firmness.

The curd is washed with cold water after all the whey has drained off, then cooled with cold water, drained and salted at the rate of 2-2½ lbs. salt per 100 lbs. cheese. The cheese is then packed and stored in refrigerated rooms until sold, being usually consumed within four days of manufacture.

Cottage Cheese as Made in Queensland.

Cottage cheese is made from skim milk which is pasteurised to 156-160° F. and then cooled to 90° F. The usual practice is to pasteurise the whole milk as received and then separate the pasteurised whole milk and run the skim milk direct into the making vat.

Ripening and Preheating.—The percentage of starter culture required depends on the initial acidity of the skim milk, the ripening temperatures used, and the time of the year; it varies from 5 per cent. to 15 per cent. The starter is added to the vat and the milk is agitated while being slowly heated to 98-102° F. This heating process, which should take place as rapidly as possible, has been found necessary in Queensland to bring about the desired firmness of curd at the time of coagulation. When the desired temperature is reached the agitators are stopped and the vat covered and allowed to ripen. In from 4-6 hours from the time the starter is added the milk should have coagulated and show an acidity of from .75 to .85 per cent. If the temperature has not dropped too low, the curd should be ready to work at this stage.

Breaking the Curd.—The usual practice in America is to cut the curd with curd knives, the blades of which are set ½ inch apart. In Queensland it was found that the loss of curd in the whey was too great and it is necessary to break up the coagulum by hand. The curd is broken up and slowly agitated by hand. This gradually firms up the curd, and all stirring until wheying off must be done by hand as hand rakes and mechanical agitators are too severe.

Cooking.—The batch is slowly heated (or cooked) at the rate of ½° F. per minute, increasing the temperature to as high as 20° F. above the temperature at the end of the ripening period. The temperature and period of time depend on: (a) The rate of acid development during ripening; (b) the acidity at the time of breaking; (c) the body and texture of the curd. The body and texture of the cheese must be closely checked at this stage, the best method for doing this being to place a handful of curd in cold water. This brings about rapid cooling and gives an indication of what the resultant cheese will be like. If the batch is ready to whey off, the curd will be firm without being tough, will crumble readily in the hands, and the curd particles will not have soft centres.

Wheying Off.—The whole of the curd is drawn back to the top end of the vat and allowed to settle. This can best be done with curd rakes and draining boards, and care must be taken not to break up the curd lumps and so increase losses in the whey. As wheying off is progressing, drains are made in the centre and sides of the curd to speed up the process. The whey at this stage should be clear and show an acidity of from .60 per cent. to .70 per cent. depending on the acidity of the bulk at the time of breaking of the curd. The curd is then allowed to drain for 5-10 minutes until most of the whey has escaped.

Cooling.—When the curd has reached the desired stage of firmness at wheying off, the temperature of the curd is still within a few degrees of the cooking temperatures. If the curd is allowed to remain at this temperature for any great length of time it will result in too much firm-

ing up of the cheese. For this reason, cooling should be carried out as soon as possible after the bulk of the whey has escaped from the curd particles. The cheese is spread out over the bottom of the vat in evenly-sized blocks and cold water allowed to run through the vat. After a few minutes, the draining tap is shut and cold water added to the vat until the curd is completely covered. The curd is left in this water for 10-20 minutes, after which the water is drained off.

Salting.—When draining is completed the cheese is salted at the rate of 10-20 ozs. per 100 lbs. of cheese. The salt is spread evenly over the cheese, the cheese being then packed into suitable containers for transport to the consumers. It is advisable to hold the containers (usually cans) in a refrigerated room until the cheese is consumed, as low temperatures retard bacterial development and deterioration of quality.

Yield.—The yield of cheese is usually from 130-140 lbs. per 100 gallons of skim milk treated.

General Remarks.—Cottage cheese has a higher moisture content than ordinary hard types of cheese, and for this reason even more care than usual must be taken to see that all equipment used is thoroughly cleaned and sterilised.

In addition to this, the following rules must be observed:—

- (a) Keep the pasteurising temperature (flash method) within even limits, viz., 156°-160° F. If all equipment is in a clean and sterile condition these temperatures should give a satisfactory "kill." If temperatures above these limits are used (e.g., 165°-170° F.) it will be found necessary to increase the cooking temperatures to bring about the desired body and texture.
- (b) It is imperative to use a pure starter culture to give clean acid development. A contaminated starter culture will result in unclean and "off" flavours in the resultant product.

Common Defects in Cottage Cheese.

1. *Weak and Mushy Body.*—This is due to too high a moisture content in the cottage cheese brought about by the following:—(a) Cooking at too low a temperature; (b) cooking too rapidly after cutting or breaking the curd.

2. *Dry, Harsh Body.*—The following are the chief causes of this defect:—(a) Too high a cooking temperature, which results in too much moisture being driven out of the curd and the curd being firmed up too much; (b) too long a cooking period at too high a temperature which gives the same result as in (a).

3. *Sour, Overacid Flavour.*—This is usually allied with weak and mushy body and is exaggerated by the following:—(a) Too rapid ripening (too much starter) or too high an acidity at breaking or cutting; (b) not allowing the whey to drain completely from the curd at wheying off; (c) cooling water added to curd too soon, which firms the curd particles and prevent the complete escape of the whey.

Although cottage cheese is not in general use in Australia as a food stuff, there is some demand for it in certain localities. Its manufacture serves a very useful purpose in so far as the cream is available for manufacture into butter and the skim milk is utilised for cottage cheese, thus giving the factory a worthwhile return. This kind of cheese is used as a savoury, but can also be served as a sweet in conjunction with stewed fruits, &c., and provides a valuable source of readily available proteins.

Hand Feeding Dairy Stock on the Darling Downs.

W. J. PARK.

THIS article is not intended to cover the technical aspects of feeds and feeding, but to give a practical example of what can be done by supplementary feeding in a dry time, and is being done on the property of Mr. G. Armitage, of Yargullen, near Oakey.

Before giving particulars of hand feeding as carried out by Mr. Armitage, the following points should be considered:—

1. No supplies of green feed were available on the farm until 18th July.
2. Supplies of dry feed in grass paddocks were rank and coarse, because of abnormally heavy rainfall early in the season.
3. The only farm-grown feeds were some wheat and grain sorghums which were valued at ruling market rates.
4. All other feeds used (viz., oaten hay, wheaten hay, m'lo, barley and wheat) were purchased on a high market.
5. Suitable lucerne chaff and protein concentrates could not be bought when required and the best use had to be made of available feeds.
6. The grain was fed in the proportion of 3 parts grain sorghum to 1 part barley, and was fed with wheaten and oaten chaff. (Mr. J. Zerner, manager, Yargullen Cheese Factory, assisted with the working out of rations.)
7. All stock were fed twice daily with nose bags, as feeding stalls had not been erected on the farm.
8. Hand feeding started on 13th May when the milk supply had already dropped to half the peak production. It should have been started at least one month earlier.
9. At the commencement of the feeding trials 24 cows were in milk; 16 had been milking five months or longer; and six came in fresh between 13th May and 1st July, giving a total milking herd of 30 cows, which may be considered an average herd for that time of the year.

Table 1 shows the decline in the monthly milk supply reviewed at the factory from February to June, 1944.

TABLE 1.

1944	February	March	April	May	June
Gallons of milk	49,161	43,007	26,003	17,286	17,280

Milk Supplied to Factory by G. Armitage from 1st April to 21st July.

Table 2 which is self explanatory, gives the average daily quantity of milk supplied by Mr. Armitage for weekly periods, comments re feeds, feeding costs, factory pay, and tests. All stock were hand milked from the start of feeding to find which individuals responded better to hand feeding. All details of gallons of milk received, butterfat tests and payout have been taken from the factory books.

TABLE 2.

Period of Time	Average Daily Milk Supply in Gallons	Weekly Butterfat Test	Factory Pay	Feeding Cost	Remarks
April.					
1st-8th ..	36.5	Average 4.4	..	..	No green feed. Grazing in dry grass paddocks
9th-16th ..	32.1		..	..
17th-24th	29.2		..	..
25th-30th	24.1		£49 8 0	Nil	
May.					
1st-8th ..	22.5	4.2	..	..	No green feed. Grazing in dry grass paddocks; started hand feeding 13th May. Fed twice daily before milking
9th-16th ..	22.0	4.2	..	..
17th-24th	28.8	4.1	..	..
25th-31st	28.1	4.2	£38 7 8	£18	
June.					
1st-8th ..	38.6	3.9	..	..	No green feed. Grazing in dry grass paddocks. Grain ration increased 50 per cent. on 1st June
9th-16th ..	38.3	3.9	..	..
17th-24th	40.7	3.8	..	..
25th-30th	43.7	3.7	£61 10 0	£28	
July.					
1st-8th ..	44.1	3.6	Estimate £82	Estimate £25	No green feed. Grazing in grass paddocks. Started on green feed on 18th July when hand feeding was reduced to 50 per cent. grain ration only.
9th-16th ..	51.4	3.6			
17th-21st	56.0	..			

Daily milk supply reached 60 gallons on 21st July, 1944.

Average factory test dropped from 4.1 in April to 3.6 in July.

Lessons from this Example of Supplementary Feeding.

Very little hand feeding was carried out during the recent dry spell. Its effects, so far as the producer was concerned, were twofold:—

1. The loss of production at the time of the dry spell. This resulted in numbers of cows being dried off after milking from 4 to 6 months only.
2. When supplies of green feed became available the stock were in poor condition and unable to show an immediate increase in production. In fact, in many cases they will not reach the production they would have attained if they had not been underfed in the dry spell.

From the viewpoint of factory operations the effects were also twofold:—

1. Reduced supplies to the factories resulted in increased manufacturing costs per lb. of cheese.
2. Apart from the reduced supplies due to the dry season there was also a lowered yield of cheese per lb. of butter fat, as the compositional quality of milk, especially non-fatty solids, was adversely affected by the low nutritional level of stock feeding, in the period referred to.

If controlled hand feeding had been carried out by all suppliers to the Yargullen factory, and allowance made for the normal decline in milk supply (not due to seasonal conditions) it is estimated that the

monthly milk supply to the factory could have been 35,000-40,000 gallons of milk for April, May and June, instead of the actual amounts received as shown in Table 1.

In regard to hand feeding a warning must be given that haphazard feeding does not pay and the practice of throwing quantities of hay on the ground for stock to trample and waste is uneconomic.

Conclusions.—If hand feeding had been adopted generally by suppliers, their returns would have been benefited in a fourfold manner:—

1. By an increased yield of milk during the period involved.
2. By an increased yield when the season broke due to stock being in good condition.
3. By an increased price per lb. for butter-fat due to the lowered factory costs.
4. By an increased yield of cheese per lb. of butter-fat, because of the effect on cheese yielding capacity of milk from cows on an adequate diet.

Some Notes on Breeding.

S. E. PEGG, Dairy Inspector.

ALL dairy farmers need some knowledge of the principles of breeding. The four basic laws of breeding are:—

1. *Mendel's Law of Heredity.*—This law was propounded by the famous Austrian monk, Mendel, who was the pioneer in scientific studies on breeding. Mendel, working with peas, proved that there were definite laws of averages operating in respect of the transmission of characteristics from parents to progeny. The science of animal breeding is bound up with complex studies in cell structure, living matter, and germ cells in reproduction, but a simplified version of portion of Mendel's theory is that for the consideration of breeding an animal or plant must be regarded as representing a collection of characteristics and that:—

- (a) Each characteristic is controlled by one or more determiners;
- (b) Each determiner is composed of two factors;
- (c) At the time of mating (conception) one factor of each determiner is obtained from each parent.

It is generally believed that at each mating the sire and the dam play an equal part in determining the make-up of the off-spring. Of course, if one parent is much superior—e.g., the sire, in the mating of a pure-bred, production lineage bull with a scrub cow—it will probably stamp its desirable qualities noticeably on the off-spring. Such an animal is then said to be *prepotent*.

The characteristics of the individual are thus determined at the time of conception. After the female cell has been fertilised by the male cell, nothing but food enters the fertilised egg and the character of the developing embryo has already been determined by the factors and determiners contributed by the parents. The extent to which the progeny will develop in accordance with its inheritance may, however, be conditioned by environment. That is, the condition under which the animal is kept as regards climate, feed, and care may enable it to develop or produce to its inherited capacity or otherwise.

Examination of large numbers of records has shown that on the average, the parents contribute 50 per cent. of the genetic make-up of an individual, the grandparents 25 per cent., great-grandparents 12½ per cent., and the influence of each generation is one-half of the generation which precedes it.

2. *Law of Like Begets Like.*—This implies that the offspring will resemble their forebears in their physical and other characteristics. It is used as the foundation of improved breeding, but the offspring will always vary to some degree from the parents, the extent of this difference being chiefly governed by the uniformity of type, proportion of purity of blood in parents, closeness or otherwise of relationship of parents, and so on.

3. *Law of Variation.*—As stated, no two individuals are ever exactly alike; variation is ever present. This variation may be one of two kinds:—

(a) Congenital variation: This is, born in the animal, a variation transmitted from parents to offspring. It is largely accounted for by the inheritance from antecedents other than the parents. By a process of judicious selection and breeding from desirable variants, new breeds possessing distinctive characteristics may be founded.

(b) Acquired variation: This differs from congenital or inherited variation by resulting from environmental factors, like climate, feeding, and care. For instance, as stock become better bred it is essential for improved feeding to accompany the breeding practices, or the stock will deteriorate. Acquired variation is thus considered not to be capable of being passed on from one generation to another.

4. *Law of Atavism.*—This law refers to the tendency for animals to revert in resemblance and other qualities to remote ancestry. The resultant individual is often referred to as a "throwback," and the phenomenon is known as *reversion* or *atavism*. As there has been a steady improvement in the breeding of stock a "throwback" is generally an inferior animal. An example of atavism is seen in the occasional appearance of small horns in polled breeds.

Systems of Breeding.

1. *Pure-Breeding.*—Where animals have been consistently bred for many generations with some fixed ideal in front of the breeders, it is found that most of the characters become fixed and are transmitted with practical certainty. When this stage is reached, a pure breed has been established. Amongst pure breeds, however, variations are still found, the variations being limited to the group of characteristics belonging to the particular breed. As a result of the careful operations of different breeders, *strains* or *families* are developed within each pure breed. Improvement within pure-bred stock is effected by means of selection within the breed. In other words, it does not necessarily imply because an animal is pure bred that it is of high quality. Once started on one particular type or strain inside any breed, it is necessary for the stock-owner to continue to build up on that strain, especially by pursuing a course of line breeding, and only introducing an outcross (entirely unrelated strain) occasionally when it is desired to introduce some new character. After this outcrossing, line breeding is again resorted to. By a policy of going to different breeders for unrelated sires to mate with each generation of females, outbreeding is being constantly followed

and it is not possible to establish a uniform herd; in other words, the genetic make-up becomes mixed. Uniformity of type is attained by following line-breeding within the favoured strain.

In pure breeding there are recognised systems according to the degree of relationship within the breed of the animals being mated. These are—(a) in-breeding, (b) line-breeding, (c) out-breeding or out-crossing.

(a) *In-breeding* is the mating of closely related animals; e.g., son to mother, father to daughter, brother to sister. The object is to secure uniformity and to rapidly fix some desired characteristics. However, in-breeding will also rapidly bring out any faults and, because of this, can only be used by breeders who are intimately acquainted with the ancestry of the stock and are prepared to cull drastically. It is too dangerous a system for the ordinary stockbreeder to pursue.

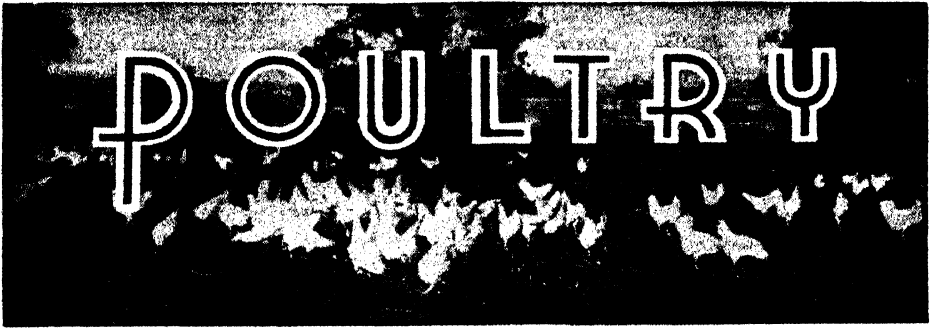
(b) *Line-breeding*.—This depends on the breeding from animals of a single line of descent. It is really a modified system of in-breeding in which the relationship is more distant; not nearer than cousins. It secures uniformity of type and enables the fixing of desirable qualities in a relatively short period without the risks inherent in in-breeding. In line-breeding the breeder should know the characteristics of the animals and all stock being bred should be carefully selected after a personal examination. It is not satisfactory to buy on a pedigree alone.

(c) *Out-breeding or out-crossing* is the term used to describe the mating of pure-bred animals of different strains or bloodlines. The judicious introduction of an outcross is advisable in a herd being linebred when it is desired to introduce some new character. After this outcross line-breeding is again resumed.

2. *Cross-breeding*.—A crossbred is the progeny of the mating of parents of two distinct purebreeds—e.g., A.I.S. bull and Jersey cow. Although cross-breeding is commonly followed with certain stock—e.g., to produce fat lambs and in pig raising—it is not recommended in dairy herds. The first cross may possess all the dominant features of each breed and be a superior animal, but even for meat animals cross-breeding should always stop at the first cross, as cross-bred animals, when mated, will not transmit desirable qualities.

3. *Grading-up*.—This is the system of breeding advocated for the improvement of ordinary commercial dairy herds. It requires the use of successive pure-bred sires of the same breed on cows selected from common stock. In grading-up a dairy herd, a start is made by mating indifferent female stock with a pure-bred bull of the breed selected. The female progeny of the first mating are then mated with a pure-bred bull of the same breed and the process continued on through successive generations. If inferior females are gradually culled, and improved production sires are successively introduced, the herd will, within three or four generations, have attained a uniformity of appearance similar to pure-bred stock and their production will have been considerably improved. A high-class grade herd is capable of producing just as well as a good pure-bred herd.

Irrespective of the system of breeding followed, success can only be achieved by the rigid culling of animals not up to standard as regards type, constitution, production, and fecundity. It is equally necessary to provide adequate feed at all times to ensure that stock will develop and yield to their inherited capacity.



Diseases of Chickens and Growing Stock.

L. G. NEWTON, Veterinary Officer.

WITH the rearing season now in progress, it is appropriate to warn poultrymen to take every precaution against the many diseases which cause heavy losses each year amongst chickens and growing stock.

Disease will occur in all poultry yards at some time or other, but if control measures are immediately put into operation an otherwise serious loss may be prevented. If the disease is not recognised, the best procedure is to seek advice from the Department of Agriculture and Stock or submit one or two live birds showing typical symptoms to the Animal Health Station, Yeerongpilly, for examination.

Pullorum Disease.—When heavy mortality occurs in chickens up to 10 days old, pullorum disease should be suspected. Its presence, however, can only be confirmed by laboratory examination and three live or freshly dead birds should be submitted at once to the Animal Health Station for this purpose. There is no treatment and it is therefore essential to know whether the disease is present or not so that the survivors can be either destroyed or reared away from other birds and later blood tested. If the farmer is breeding his own chickens, he should arrange for a blood test of the breeding stock, and if not, insist that chickens which are purchased are from blood tested stock and hatched under conditions free from infection.

Coccidiosis.—Coccidiosis usually occurs at from 3 to 10 weeks and accounts for more deaths than any other disease of growing stock. The affected birds become pale, lose condition, and huddle together with ruffled plumage, and the wings drooped to the floor. Blood may be passed in acute outbreaks.

The most effective control measures consist of strict attention to sanitation. Cleaning the pens every 24 hours is necessary in acute cases. To facilitate cleaning, each unit should be of convenient size, e.g., 100-250 chickens. A light covering of litter, e.g., wood shavings, will assist in drying out moisture in the droppings and, at the same time, prevent the droppings from sticking to the floor. The inclusion of milk in its various forms in the ration is beneficial. A suitable mixture can be made up of milk 40 parts; maize meal, 50 parts; bran, 10 parts. Although many medicinal treatments have been prescribed, their value

is limited and, if used, they should be combined with measures of sanitation. Every effort should be made to anticipate the outbreak and apply immediately the most intensive methods of control.

Fowl Pox.—Fowl Pox occurs in practically all parts of the State where poultry are kept. It may take one or a combination of several forms. The commonest is the appearance of wart-like growths on the unfeathered parts of the head; cheesy masses may occur in the mouth and throat, or a catarrhal condition of the eyes and nostrils accompanied by discharges may be seen. Provided that the birds are otherwise healthy the disease usually takes a mild course, most cases simply showing a few warts and recovering quickly.

Where time permits, dressing the unfeathered parts of the head three times weekly with 10 per cent. carbolic ointment will prevent the spread of warts and repel mosquitos which act as spreaders. Complicated cases are better destroyed and burnt. Where the disease occurs annually, the vaccination of all young stock is recommended as a means of prevention.

It must be stressed, however, that only healthy birds should be vaccinated; vaccinating unthrifty birds or those suffering from any obvious disease is only courting trouble. It is also important to remember that if a portion of the flock is vaccinated, the disease may occur in a severe form in the remainder of the young birds. It is essential, therefore that all young birds be done.

Deficiency Diseases.—Another disease generally classed under the heading of roup is due to Vitamin A deficiency. Affected birds are pale, particularly the yellow pigmented breeds, and in typical cases white pustules appear in the gullet and the kidneys have a frosted appearance. It can be prevented by feeding Vitamin A rich foods, e.g., cod liver oil, green feed, lucerne chaff, and yellow maize.

Deficiency of riboflavine (one of the vitamin B factors) has occurred in chickens of 3-6 weeks of age during the past two years. The toes are curled in and the birds move about on their hocks. This condition can be effectively treated by the inclusion of liver, liver meal, bran, milk, &c., in the ration.

Worm Parasites.—Worm parasites often assume pathogenic importance, particularly where chickens are being reared semi-intensively or on unspelled ground. Treatment in these cases should be applied promptly, the most satisfactory method being a flock administration of nicotine sulphate at the rate of $\frac{1}{2}$ c.c. per 1 lb. of food daily for four to six days. This drug is in short supply at present, but can be obtained by making application to the Poultry Branch of the Department. To treat the birds, calculate the amount of mash required by each pen for the day and measure accurately the amount of nicotine sulphate to be added on the basis of $\frac{1}{2}$ c.c. per 1 lb. of food. Add this to half a cup of water, rub through a handful of bran and mix thoroughly through the mash. Treatment is of little value, however, if the birds are returned to dirty pens afterwards. They should be given new or spelled ground and failing this the pens should be thoroughly cleansed and disinfected.

Hatchery Hygiene.

P. RUMBALL.

IN the control of pullorum disease fumigation of the incubator is practised by many, but often little or no consideration is given to the possible presence of other diseases. Where blood testing of the breeding stock has been done, many do not even fumigate. A disease that is not at all uncommon among very young chickens is *Omphalitis*. This disease may be contracted within the incubator, especially when the navel is not closed and infection is present.

Incubator hygiene cannot be well conducted without due consideration being given to the cleanliness of the incubator room, for any infection within the incubator can be conveyed to the room in the fluff and material that is distributed through the vents of the incubator, and in the process of taking hatches off. There also is the possibility of chickens contracting infection in chicken boxes, consequently hatchery owners or operators should be particularly careful to see that this possibility is reduced to a minimum by the use of new packing material for each lot of chickens, and the thorough cleansing of chicken boxes which have to be re-used. Therefore, sound hygienic practice has to be observed in the room, the incubator, and the chick box.

The Incubator Room.

The cleansing and disinfection of the incubator room should not be left from the end of one season to the beginning of the next. In a well managed hatchery cleansing and disinfection is almost a daily practice. Cleansing should not be restricted to the inside of the incubators and the floor of the room. Walls, ceilings, shelves, and the tops of the incubators all collect dust and fluff, probably carrying infection. The material which lodges on such surfaces, usually so very light, may be again circulated within the room by the slightest air current; therefore, the floors, walls, shelves, and other places of lodgment should be frequently freed of this dust and fluff and the floors washed and disinfected.

Cleansing the Incubators.—After the removal of the shells and dead embryos from the egg tray, the dried and caked excreta and other material should be scraped off. The egg trays should be immersed in a disinfectant solution of sufficient strength to kill germs and then scrubbed clean. In machines having a separate hatching compartment the fluff should be removed, dried material adhering to any part scraped off, and the whole interior thoroughly washed with a disinfectant solution. Disinfection cannot be thorough without the removal of adhering material. With all types of machines, immediately on opening them up fluff becomes disturbed. This should be cleaned up early to prevent its widespread distribution and possible reinfection of the machine.

In incubators without a separate hatchery compartment, as much fluff as possible should be removed after each hatch and the interior of the machine cleaned thoroughly. Egg trays should be treated thoroughly in the way already recommended.

The need for cleansing and disinfection cannot be over-emphasised. Infection may be carried into the machine on the shells, while within the egg organisms which cause disease, such as pullorum disease, may

be present and are consequently distributed when the infected eggs are hatched. The newly-hatched chicken contracts these infectious troubles by inhalation of infected material, or through an imperfectly closed navel. Cleaning and disinfection reduce to a great extent the possibility of infection.

Fumigation of the Incubator.—Fumigation is a method of disinfection practised by many, but one that, again, is perfected by a thorough cleansing and scrubbing. The most common is formaldehyde and potassium permanganate, the quantity used being in direct relation to the size of the incubator.

To fumigate a room of 1,000 cubic feet capacity, 8 ounces of formaldehyde and 4 ounces of potassium permanganate are necessary. If the incubator (inside measurement making no allowance for egg trays, &c.) is 10 feet by 5 feet by 2 feet the space to be fumigated would be 100 cubic feet; therefore, only one-tenth of 8 ounces of formaldehyde and one-tenth of 4 ounces of potassium permanganate would be necessary. The quantities should be exact to be efficient, and the machine should be run at the normal temperature and humidity kept high. The procedure recommended is as follows—Place the potassium permanganate in a pan about 2 inches deep, heap it up and hollow out the centre. Place the pan in the incubator and then pour into the hollowed centre of the permanganate the formaldehyde, after which quickly close the door.

Fumigating while eggs are in the incubator is done in the same way, but the fumigant should be removed within 15 minutes. It is best applied when eggs are at the end of the 18th day of incubation and are placed in the hatching compartment. Although the gas will destroy germ life, it has little effect on the chicken, and fumigation may safely be done although an odd egg or two may have chipped. In machines without a separate hatching compartment fumigation may be practised once weekly.

Fumigation when the hatch is advanced is not recommended

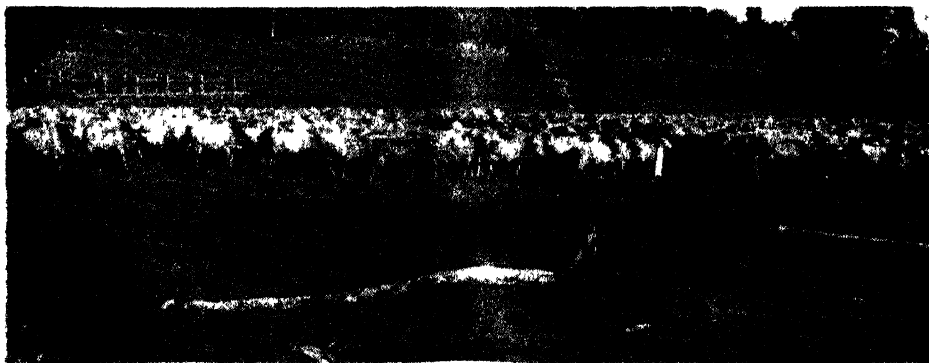


Plate 14

MERINO FLOCK ON KINDON NEAR GOONDIWINDI.

ANIMAL HEALTH

Scours in Calves.

L. G. NEWTON, Veterinary Officer.

IN Queensland, it is a common practice to rear dairy calves from birth to 3-4 months of age in small, bare, permanently-occupied pens or small paddocks, feeding being more or less routine farm work. Under these conditions scours frequently occur; in fact, from the number of inquiries made at the Department, this is easily the most common disease of young dairy calves and must cause a large number of deaths in the course of the year. What is even worse, those cases which recover remain unthrifty and stunted.

Types of Scours.

Nature intended the digestive system of young calves to be able to cope only with small amounts of milk taken at frequent intervals. Consequently, over-feeding, irregular periods between feeds, sudden changes of feeding, or too rich milk may bring about a severe digestive disturbance with subsequent scours.

When suckling the cow, the milk is taken in slowly and in small amounts. When it reaches the stomach the secretion of this organ causes curdling, but the curds are small in size, and, therefore, easily digested. When bucket-fed, however, say twice daily, the milk is swallowed quickly and a large mass of curd is formed which overtaxes the digestive system. Similarly, if the milk becomes cold before feeding, much of it may pass into the paunch where it cannot be digested and simply sours. Fat is the most difficult constituent of milk to digest and too-rich milk—i.e., over 3.5-4 per cent. butter-fat—may upset the digestion.

Thus incorrect feeding is often responsible for simple diarrhoea, but, more important, it predisposes the calf to the more severe and often fatal form of white and blood scours due to bacterial infections.

Source of Infection.

It is well known that within the bowel there are countless bacteria, some of which are useful in assisting in breaking down food material; others which are harmless; and others which, while they do not cause harm ordinarily, become pathogenic under favourable conditions. Thus, when the calf's digestion is upset and it becomes weak, these organisms quickly multiply, cause irritation and inflammation of the bowel, and, as a result, diarrhoea or scouring follows. The dung passed teems with organisms.

Similarly, older animals which have recovered from an attack of scours pass out the organisms in their dung for some time and, consequently, the pen becomes heavily contaminated, so that each calf placed

in the pen may be subjected to severe infection from birth. It is obvious, therefore, that the permanently-used calf pen is a constant source of infection for new calves.

Again, some newly-born calves have an imperfectly closed moist navel. This area is particularly prone to infection and should the calf be placed in infected pens infection quickly enters by this route and symptoms may develop within a few days.

Effects.

The effects of scours are well known and require only a brief description. Calves may be affected within a few days of birth. They refuse to suck, appear sick, and diarrhoea gradually develops, the motions becoming gradually more moist until they are liquid, greyish white and foul smelling. The calf may become prostrate and die.

With older calves, the onset is rather slower, the calf at first not drinking as well as usual. As the disease progresses, the appetite decreases, the sides are tucked up, the eyes are sunken and dull, the ears droop, the nose is dry, and the animal lies on its chest or side groaning, grinding its teeth and straining. The scour is now liquid, dirty grey, and foul smelling in the case of white and red in the case of blood scours. The calf may survive for two or three weeks with white scours, but death is usually rapid with blood scours.

Complications such as pneumonia and swelling of the joints frequently occur especially in calves affected soon after birth.

Prevention.

As many calves die each year and those which recover are stunted, every effort should be made to prevent the disease occurring; and there is no doubt that where vigorous precautions are taken to prevent it, the disease can be controlled by correct management. The following principles are set down as a guide:—

1. Examine the navel of each new-born calf immediately it is brought into the yard. If moist, the stump should be swabbed with strong iodine.

2. Calves should be reared in clean surroundings. If small pens are necessary to confine the calves for convenient feeding, the floors should, preferably, be of concrete. The calves can be kept on this for a full fortnight and then given the run of a grass paddock and brought in only for feeding. When it is not possible to put down concrete, plough up the pens regularly and, preferably, make two pens which can be used in rotation.

3. Young calves should be kept away from older ones as far as practicable. Apart from knocking the small ones about, the older calves may carry infection which is spread to the younger calves.

4. Observance of the following cardinal points in feeding is most important:—

- (a) Always allow the calf its mother's colostrum. This is essential, because the milk contains substances which increase the resistance of the calf to scours and other diseases.

- (b) Feed the correct amount—i.e., 1 lb. of milk to each 10 lb. body weight per feed.

- (c) If it can be arranged, feeding may be spread over three or four periods daily, but it is better to give two regular feeds than more feeds haphazardly.
- (d) The fat content should not be higher than 4 per cent.
- (e) Use lime water as a routine measure for all calves. Commence with two tablespoonsful and gradually build up to half a pint per feed.
- (f) Make changes from whole to separated milk gradually. The onset of scours often coincides with the change-over, indicating that it has been made too suddenly, upsetting digestion and precipitating the outbreak of the disease which might otherwise have been withstood.
- (g) Feed at the correct temperature—i.e., blood heat.

These recommendations are set out more fully in the December, 1943, issue of this Journal and should, if possible, be read in conjunction with it.

Treatment.

Since scouring may be due to many causes it is only possible to prescribe the following general symptomatic treatment until the specific cause has been identified by clinical and laboratory examination:—

- (a) Immediately scouring appears, isolate the calf and dose with 2-4 oz. of castor oil. Starve for twenty-four hours.
- (b) The first feed following this period should be made up of half of the quantity of milk previously used, with an equal amount of lime water. Warm up to blood heat before feeding. As the calf recovers gradually return to normal feeding.
- (c) If scouring does not cease add a teaspoonful of chlorodyne to each feed.

If recovery does not seem likely at the end of a fortnight, it is advisable to kill and burn the animal.

When a dairy farmer has had repeated losses of calves from scours, he should contact the nearest veterinary officer or inspector of stock with a view to having the animals examined and, if necessary, the appropriate specimens submitted to the Animal Health Station for laboratory examination. When the cause is established, more definite and specific treatment can be given. This is important, because worm parasites are often the cause of scouring in which case the treatment set out above would be of no value.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Contagious Abortion (*Brucellosis*) of Cattle.

M. R. IRVING, Veterinary Officer.

Economic Importance.

LOSSES caused by brucellosis of cattle on the Darling Downs far exceeds those of any other disease of cattle, with the possible exception of contagious mastitis. It is impracticable to compute with accuracy the economic loss caused by this disease. The reduction in milk yield due to sterility, premature calving, or prolonged sickness associated with abnormal parturition; the high mortality rate and unthriftiness of newborn calves; and the serious disruption of stud breeding all add up to a considerable annual loss to the industry.

The milk yield of cows infected with brucellosis may be 20 per cent. lower than that from similar healthy animals, even though the infected animals may not abort.

Cause.

Brucellosis is a contagious disease caused by a specific micro-organism and is quite independent of, and unrelated to, another common disease of reproduction, contagious vaginitis. This fact is not generally realised by farmers and much expense is fruitlessly incurred by them in attempts to treat both diseases in the belief that they are identical. The chief sites in the body of the causal organism of brucellosis are the uterus (womb) and the udder. An infected cow will therefore discharge vast numbers of disease-producing organisms in the after-birth, uterine discharges and milk. This occurs in all diseased cows, whether they have actually aborted or calved apparently normally.

Mode of Infection.

The organisms which have been thus distributed about the bails and yards, water troughs and on the pasture, gain entry to other healthy animals by way of the mouth. This is the main channel of infection. Cattle grazing on discharge-contaminated feed or licking infected cows when "bulling" are dangerously exposed to infection. The common belief that the bull is responsible for spreading the disease is unfounded as, in spite of many experimental attempts, it has not been possible to transmit brucellosis by service. Although service is a much less common source of infection than is the eating of contaminated feed or pasture, a dairy farmer would be very unwise to allow an infected bull to serve his cows, as transmission possibly does sometimes occur in this way. On the other hand, flies which have fed on an infected after-birth may carry the disease to healthy animals by depositing germs in their eyes, from which the organisms are readily absorbed into the bloodstream.

Being so highly contagious, brucellosis spreads very quickly through a herd and is often well established, with a high percentage of infected cows, before the owner is aware of its presence. It is this fact which demands that owners should be quick to recognise evidence of the disease and equally quick to confirm suspicions by the application of a test. Once evidence of infection is established the immediate institution of control measures is imperative.

Symptoms.

The symptoms which follow infection with the organism of contagious abortion vary considerably in different animals. Abortion of the foetus (developing calf) is the most spectacular symptom and is easily recognised. This usually takes place in the latter half of the period of pregnancy. Abortion (of the foetus) may also occur from other causes not connected with the disease; however, brucellosis is by far the commonest cause of abortion, so that all abortions should be regarded as due to this disease unless blood tests have proved that the disease is not present; if abortions are frequent or occur in a wave then brucellosis should be strongly suspected. One thing which masks the presence of the disease in a herd is the fact that many infected cows never abort, but are more liable to suffer from retained after-birth, sterility, and irregular breeding habits, which all lead to a considerable reduction of milk supply. Such unreliable symptoms, therefore, do not offer a very safe basis for making a diagnosis of contagious abortion unless they are so widespread in a herd as to make profitable production impossible. It is most desirable that a sound diagnosis be made long before the disease has reached such serious proportions.

Diagnosis.

If an owner suspects an animal of being infected, he should isolate the suspect from the rest of the herd and collect a blood sample and send it direct to the Animal Health Station for testing. This prompt action will avert any delay which might occur in arranging for a test of the whole herd. Should the animal prove positive, it is obvious that an early test of the whole herd is essential in order to forestall further spread of the disease. If the result is negative, a careful watch should be kept for any future evidence. Failure to take this simple precaution has resulted in many herds becoming so heavily infected that elimination of the disease is little short of disastrous to the herd which may have been carefully built up over many years.

Another fatal mistake so frequently committed in the past by dairy farmers is the refusal to acknowledge obvious clinical evidence of the disease and the misguided resort to all sorts of expensive "quack" medicines which purport to cure every disease of livestock, including abortion. Many dairy farmers have tried all sorts of patent remedies over periods of several years, during which the disease has become more firmly established in the herd. Unfortunately for them, it is a fact that most animals which contract the disease abort but once only, and afterwards carry their calves apparently normally. This deception of nature has cost many dairy farmers dearly by leading them to the false conclusion that the remedy was having at least partial success. These cows may give birth to a normal calf, but the discharges and after-birth teem with germs and so spread the infection.

Agglutination Test.

This test offers the only means of detecting infected animals, particularly those which have failed to reveal themselves by aborting, but which, nevertheless, are potent sources of infection for healthy animals in the herd. This agglutination test, as it is called, is carried out at the Animal Health Station, Yeerongpilly. All that is required for the test is the taking of a sample of blood from each animal in the

herd (about half an ounce of blood from each) and sending them by the quickest means to the laboratory. The test is carried out free of charge to the dairy farmer.

The technique of the test is complicated, but it would suffice to say here that it depends on the biological fact that in the blood of all animals affected with brucellosis there are certain combative properties which have been developed by the animal to fight the disease organisms, but which have not been developed in the blood of a healthy uninfected animal. The test is designed to detect this property by delicate bacteriological procedures.

The Collection of Blood Samples.

The collection of blood samples is a simple matter, if proper facilities are available. The best conditions are provided by the old type sword bail which holds the animal firmly by the neck. This bail may be in the milking shed or in a convenient crush. The walk-through type of bails are not as convenient or easy to work in. With the sword bail the head of the animal is held stretched forward and a cord is passed round the base of the neck in the form of a noose. When this is drawn tight, the jugular veins on each side stand out prominently. A strong clean hypodermic needle is inserted through the skin into the vein in a forward direction and the stream of blood collected in sterilised one-ounce bottles. The bottles are each labelled so that they can be identified with the animals from which the samples were taken, and the samples are allowed to stand undisturbed for a couple of hours so as to ensure firm clotting of the blood. They should then be despatched by the speediest means to the Animal Health Station. Results are usually available within a week.

Control Measures.

1. *Test and Slaughter*.—Consists of the simple but drastic measure of testing the herd and selling for slaughter all animals found by the blood (agglutination) test to be diseased. The sooner testing is applied the less will be the losses incurred.

All animals of breeding age (twelve months and over) are submitted to the test. Positive reactors must be segregated immediately from the herd and disposed of for slaughter as soon as practicable. Delay in disposal of reactors only leads to disappointment, as healthy animals are liable to contract the disease from the reactors which remain in the herd.

Where reactors are found, re-testing at intervals of not more than forty days until no reactors remain is essential for successful and efficient eradication. The reason for this is that the last batch of reactors may have left infection behind them in the herd, and the longer these new cases are allowed to remain undetected in the herd the greater is the risk of their aborting and distributing infection to other animals. By quick repeated tests, all fresh cases are detected before they have an opportunity of replenishing the sources of infection, so that in a matter of a few months the original sources of infection shall have died out. Unless testing is carried out on these lines, it will fail to achieve its object of speedily eliminating the disease with a minimum of loss. The principle, therefore, is the re-test at intervals of not less than one month,

but certainly not more than two months. Once a clean test has been obtained, a second test at a similar short interval is advised, just to make sure. If again clean, the interval may be extended to six months and, later, to a year with safety.

It should be realised, of course, that a herd which has been freed from infection remains clean only as long as it is maintained free of contact with untested cattle. Special care in this direction is necessary, with special emphasis on precautions to be taken in introducing new animals to the herd. Cattle should not be introduced into a clean herd, or one undergoing eradication before being tested. As an added precaution, it is wise to insist on two negative tests with two weeks between tests. Any relaxation of measures adopted to prevent the reinfection of the herd may lead to a fresh outbreak of disease and the undoing of much expensive work.

The benefits arising from the eradication of brucellosis from dairy herds are undeniable. Higher production, more calves, less sterility, reduced maintenance costs, increased sale value of animals and safer milk are only a few of the more obvious advantages. On these grounds, testing and eradication are to be strongly recommended.

In some countries vaccination in various forms has been extensively practised; but the success of vaccination has been so variable and in some cases so disappointing, that its adoption here is not likely to be sanctioned until it has been developed to a stage where its merits are undisputed and reliable. In the meantime, testing is the only means of successfully combating the disease.

2. *Hygiene and Management.*—Certain other measures should be adopted in conjunction with testing and disposal of reactors. When the testing programme is under way, sometimes in the interval between tests, a cow will abort. It is essential that this cow be isolated at once and a blood sample sent in for test. The aborted foetus and all after-birth and discharges should be collected if possible and burnt. The hindquarters of the cow should be washed down thoroughly with a disinfectant solution to destroy any germs that may be present. One negative test is not enough to allow the cow to go back into the clean herd. She must give two negative tests, with a month between them, before going back to the herd. Isolation must be thorough and involves the suspected cow being milked in a separate bail, specially erected for the purpose. This means a little trouble but is well worth while if heavy infection in a herd is to be controlled with the minimum delay.

Obtain Veterinary Advice.

When a farmer suspects the presence of contagious abortion in his herd, he should consult a veterinary officer immediately. Unless the problem of eradication is tackled properly from the start with a full understanding of what eradication means and the responsibilities of the owner, confusion and disappointment are sure to follow. Therefore, the veterinary officer should be given the opportunity to explain everything thoroughly and lay down a scheme of control. The rest can then be done by the owner under the direction and supervision of the veterinarian.

GENERAL NOTES

Staff Changes and Appointments.

Under *The Dairy Products Stabilisation Acts*, Mr. August Herman Bulow (Chairman of Directors, Port Curtis Co-operative Dairy Association, Ltd., Gladstone), has been appointed a member of the Dairy Products Stabilisation Board in the place of Mr. C. W. Thiele (Sharon, via Bundaberg), resigned.

Appointments of district inspectors of stock, Department of Agriculture and Stock, have been made as follows:—

Mr. D. A. Logan, District Stock Inspector, Cairns, to be District Stock Inspector, Toowoomba.

Mr. S. J. Monaghan, District Stock Inspector, Cloncurry, to be District Stock Inspector, Cairns.

Mr. A. G. Smyrell, Stock Inspector, Dalby, to be District Inspector of Stock, Roma; and

Mr. E. T. Lewin, Stock Inspector, Boonah, to be District Inspector of Stock, Cloncurry.

The retirement of Mr. H. S. Iliff, Registrar of Brands, Senior Clerk in the Stock Branch, and Registrar of the Veterinary Surgeons Board in the Department of Agriculture and Stock, as from 30th June, has been announced. Mr. Iliff's service in the Department extends over a period of more than fifty years, during which time he has been associated with the growth of the Stock Branch from a small section to its present importance in the pastoral life of the State.

Mr. J. W. Munro will succeed Mr. Iliff as Acting Senior Clerk, Stock Branch, and Registrar of the Veterinary Surgeons Board, and Mr. F. W. Gibney has been appointed Acting Registrar of Brands.

The Minister for Agriculture and Stock (Mr. T. L. Williams) has announced that the increasing activities of the Marketing Section of the Department of Agriculture and Stock and those of the State Executive of the District War Agricultural Committees, has made it necessary to adjust responsibilities in these sections of the Department.

Mr. H. S. Hunter who, in addition to his duties of Director of Marketing, had been carrying out those of State Executive Officer since the inception of the District War Agricultural Committee organisation, will now give his undivided attention to marketing problems which, through the war, have been increasing in volume and complexity.

The approval of the Governor in Council has been given for the appointment of Mr. A. F. Bell, Acting Director of Sugar Experiment Stations, as Acting Director of Agricultural Organisation and State Executive Officer, District War Agricultural Committees, and in his new post he will have control of the D.W.A.C. organisation, part of the duties of which organisation will be to ensure the attainment of production objectives set by the Commonwealth Food Production Executive.

Under the provisions of *The Sugar Experiment Stations Acts, 1900 to 1941*, the following appointments to the Sugar Experiment Stations Advisory Board have been made by the Executive Council for the period from 1st April, 1944, to 31st March, 1947:—

Government Representatives.—Hon. T. L. Williams (Minister for Agriculture and Stock) (Chairman); Dr. H. W. Kerr (Director of Sugar Experiment Stations).

Growers' Representatives.—Messrs. B. Foley (Ascot) and J. A. Winter (Tully).

Cane Sugar Manufacturers' Representatives.—Messrs. J. W. Inverarity (Kalamia Estate, Ayr) and A. V. Thorp (Manager of Moreton Central Mill, Nambour).

State Government Purchase of Agricultural Machinery.

The Minister for Agriculture, the Hon. T. L. Williams, in the course of a recent announcement, said that the initial consignments of agricultural machinery, which had been purchased under the Government's £50,000 purchase scheme, were now arriving in Brisbane. An advisory committee had already made a provisional allotment of this machinery to districts where it could best be utilised in increasing production of food crops. Particulars of this machinery and the terms of its sale or lease had been forwarded to the District War Agricultural Committees, and Mr. Williams advised interested farmers to get in touch with the chairman of their particular district committees.

Allocation of machinery will be made on the basis of the recommendations of district committees. Preference will be given to purchases by co-operative groups of farmers in order to ensure that machines and implements will be used to their fullest capacity. Provision has also been made for sale or lease to approved contractors engaged in farming operations. Sales will be at retail prices and will carry the usual facilities of service provided by the merchandising companies. Mr. Williams further stated that the Agricultural Bank had been officially associated with the scheme and would assist farmers in financing their purchases.

In this first purchase of machinery, particular attention has been given to the needs of vegetable production and the production of fodder for the dairy industry. It includes field and garden tractors, multiple mouldboards and disc ploughs, special types of harrows, planters, power cultivators, power mowers, together with power dusting and spraying equipment, potato planters and diggers, and equipment for harvesting dry-shelled beans, which will be available on lease.

Fruit Marketing Acts—Operation Extended.

An Order in Council has been issued under *The Fruit Marketing Organisation Acts* giving notice of intention to extend the operation of the provisions of such *Acts* for five years from 1st January, 1945, and inviting a requisition of 500 fruitgrowers, as prescribed, for a ballot on the question of such continuance, to be lodged with the Minister for Agriculture and Stock not later than 28th August, 1944.

Regulations have been issued which will provide for the conduct of the ballot, if such becomes necessary.

Sugar Quarantine Area.

A Proclamation has been approved under *The Sugar Experiment Stations Acts* declaring portion of the Maryborough Mill area to be a quarantine area because of the presence of Fiji disease of sugar-cane.

Pigs May be Imported.

An Order in Council has been issued under *The Diseases in Stock Acts* which will permit the entry into Queensland of pigs from New South Wales and Victoria which are consigned to an approved piggery. At present, because of the presence of contagious porcine abortion, the introduction of infected or suspected swine from the Southern States is prohibited, except when certified free from the disease and when consigned to an abattoir, bacon factory, or the Cannon Hill Saleyards for immediate slaughter.

Extending Operations of Broom Millet Board.

An order in Council has been issued under "*The Primary Producers' Organisation and Marketing Acts, 1926 to 1941*," extending the operations of the Broom Millet Board for the period from 1st November, 1943, to 31st October, 1949.

Plant Pests and Diseases—Areas Proclaimed.

Under a proclamation issued under *The Diseases in Plants Acts* Pineapple Scale (*Diaspis bromeliæ*, Kerner) has been declared a pest. A further proclamation prohibits the removal of pineapple plants from the Rochedale district because of the presence of pineapple scale, and a regulation declares pineapple scale to be a notifiable disease.

A proclamation has been issued under *The Sugar Experiment Stations Acts* declaring the Tantitha and Avondale districts of the Fairymead mill area to be quarantine areas because of the presence of Fiji disease of sugar-cane.

Wild Life Preservation.

An Order in Council has been issued under *The Fauna Protection Act of 1937* declaring the property of A. H. G. Macdonald, Bobiberum, Miriam Vale, to be a sanctuary for the protection of fauna. Mr. R. S. G. Macdonald has been appointed an honorary protector of fauna. Mr. H. J. Millword, of Buderim Mountain, has been appointed an honorary fauna protector.

The water reserve on the property of The South Burnett Co-operative Dairy Association Ltd. at Proston, has been declared a sanctuary for the protection of fauna. The manager of the Association, Mr. C. A. Murphy, has been appointed an honorary protector for the sanctuary.

Long Distance Conveyance of First Grade Cream.

Dairy Inspector C. R. Tummon, Mackay, writes:—It is desired to call attention to what may be claimed as a record distance for cream to be sent to a factory. A dairy farmer has supplied cream from Woodstock to the Mackay Butter Factory, a distance of 257 miles by rail, and has almost invariably obtained first grade for it. Woodstock is 23 miles from Townsville on the Charters Towers line, so that all cream had to be transhipped at Townsville. Refrigeration is used to cool and hold the cream on the farm, but, this notwithstanding, it is considered a striking demonstration of just what can be achieved in spite of great difficulties.

Second-hand Fruit Cases.

An amendment of Regulations under *The Second-hand Fruit Cases Act of 1940* has been approved whereby the second-hand fruit cases committee is empowered, during the currency of a license or any renewal thereof of a dealer in second-hand fruit cases situated in any place outside the metropolitan area, to refund to such dealer any portion, not exceeding one-half, of the license fee paid by him if, in the opinion of the committee, the numbers of second-hand fruit cases dealt with by such dealer have been so limited as to justify such refund.

This adjustment of license fees has been made because of difficulty experienced, in country areas particularly, in obtaining licensed dealers in second-hand fruit cases as the flat rate of two guineas fixed by regulation as the license fee was too high in view of the small turnover of cases in many centres.

Dairy Products Stabilisation Board.

An Order in Council has been approved under *The Dairy Products Stabilisation Acts, 1933 to 1936*, appointing Reginald Campbell Duncan (Pittsworth) a member of the Dairy Products Stabilisation Board to fill the vacancy caused by the death of Thomas Dare, of Narko. Mr. Duncan was last week appointed a member of the Queensland Cheese Board in place of the late Mr. Dare, and has now been appointed Cheese Board's representative on the Dairy Products Stabilisation Board for the remainder of the late Mr. Dare's term, namely, until the 31st January, 1945.

NEW BOOK ON FRUITGROWING

**THE QUEENSLAND
AGRICULTURAL
AND PASTORAL
HANDBOOK.**

Volume II.

HORTICULTURE

Price, 4s., Post Free.

CONTENTS:

- Part I. Tropical and Semi-Tropical Fruits.
- Part II. Deciduous Fruits.
- Part III. Vegetable Growing.
- Part IV. Packing and Marketing Fruit and Vegetables.

This new publication is indispensable to orchardists, market gardeners, farmers, and agricultural students.

Obtainable from—
The Under Secretary,
Department of Agriculture and Stock,
BRISBANE.

Rural Topics

When the Cow Looks for a Lick.

If a lick is needed at any time, it is when the dairy cow is dried off in preparation for its next season of production. The production of a calf naturally takes a heavy toll from the mineral reserves in the cow's system, and if she is to be kept healthy and have a well-developed calf, a suitable lick should be provided for her, so that she might replenish those mineral reserves.

A Rubber "Persuader" for the Trucking Yard.

If there is one about the place, an old motor-tyre tube will make an effective slapper for use when trucking cattle. The tube is cut in sections lengthwise and mounted on a wooden handle. When the rubber whip is slapped on a beast it makes a loud report, which startles the animal and produces the same effect as a painful blow. Examination of slaughtered cattle has shown no bruise or other injury to the carcass through the use of this effective yet gentle rubber "persuader." The use of a rubber slapper prevents a lot of unnecessary bruising in the yard which depreciates the carcass value. It is worth remembering that bruising of beef on the hoof means a substantial reduction of the value of beef on the hook.

The Better Home.

As a topic of the day, the housing problem is among the first priorities, and here is an excellent definition of what a bright country schoolboy said in his winning essay on the subject "A Better Home":—"A better home," he wrote, "is a place my dad is proud to keep going, my mother loves to take care of, and we like to be in. It is a place to grow old in." There's surely a point in that youngster's definition for the planners of the new housing policy we've been promised.

A Cattle Crush on Every Farm.

Apart from milking, any operation to dairy cows performed in the bails always upsets them and makes them nervous for some days afterwards in the bails. Consequently, they acquire the habit of soiling the floors. A crush should be used for all operations of dairy stock except milking, such as the handling of bulls and young stock, testing for tuberculosis, inoculating, and so on. Therefore, a crush should be provided on every dairy farm so as to make the doing of these jobs much easier than they could be done without a crush.

The Weaknesses of the Landlord-Tenant System in Australia.

A committee of experts of the New South Wales Department of Agriculture was appointed recently to investigate tenant farming and it reported that insecurity and instability of tenure are causes of "low production and declining fertility." Field officers are unanimous that the landlord-tenant system is the cause of failure to adopt improved farming practices generally. They say that working under conditions where no compensation is paid for improvements, and where he may be put off a place at short notice, the tenant has no inducement to do otherwise than take all he can from the soil and put as little as possible back. On the other hand, although tenants often receive no compensation for improvements they do, no provision is made to compensate the landlord for neglect or for careless farming.

Most leases are for one year; some for three years; and a few for longer terms. The landlord-tenant system is, these experts say, characterised by failure to use written agreements, to fix rents on an equitable division of farm returns, to encourage the making of improvements, and to pay compensation for improvements. As a matter of fact, tenants are often excluded from any right to compensation for improvements they put on to the rented property.

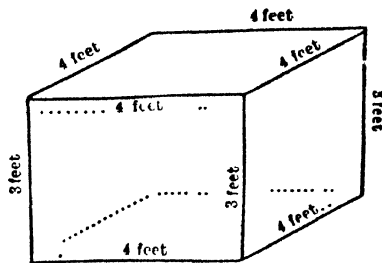
To get over many existing disabilities and preserve the fertility of the soil, the committee of experts suggests legislation and an educational campaign among both landlords and tenants. A good tenant is worth more than a high rent.

GADGETS AND WRINKLES

Tank Measurements SQUARE AND OBLONG TANKS.

EXAMPLE 4.

To find the capacity of Square Tanks. Multiply length by breadth by depth.



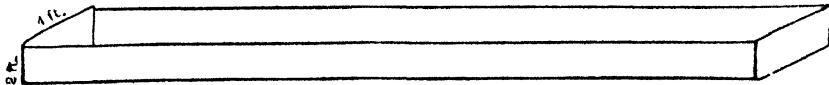
$4 \times 4 \times 3 = 48$ cubic feet, multiply by $6\frac{1}{4}$ for gallons.

$$\begin{array}{r} 288 \\ 12 \\ \hline 300 \text{ gallons.} \end{array}$$

The same rule applies to oblong tanks or channels with perpendicular sides. (See next page.)

EXAMPLE 5.

Quantity of earth removed from a channel 80 feet long by 4 feet wide by 2 feet deep,—
80 feet



Rule—Multiply length by breadth by depth.

$$\begin{array}{r} 80 \times 4 \times 2 \\ 4 \\ \hline 320 \\ 2 \\ \hline 640 \text{ cubic feet.} \end{array}$$

If wanted to know how many gallons the channel would contain.
Multiply 640 cubic feet by $6\frac{1}{4}$.

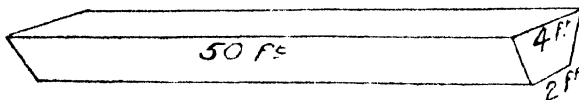
$$\begin{array}{r} 6\frac{1}{4} \\ \hline 3840 \\ 160 \\ \hline 4000 \text{ gallons.} \end{array}$$

To find the number of cubic yards, divide the number of cubic feet by 27; the above channel contains 640 cubic feet.

27)640(23 $\frac{1}{3}$, almost 23 $\frac{1}{3}$ cubic yards.

EXAMPLE 6.

Quantity of earth removed to make a channel 50 feet long 4 feet wide at top, 2 feet wide at bottom, 3 feet deep.



sum of top and bottom width divided by 2, gives mean width.

$$4 \times 2 = 6 ; 6 \div 2 = 3 \text{ mean width.}$$

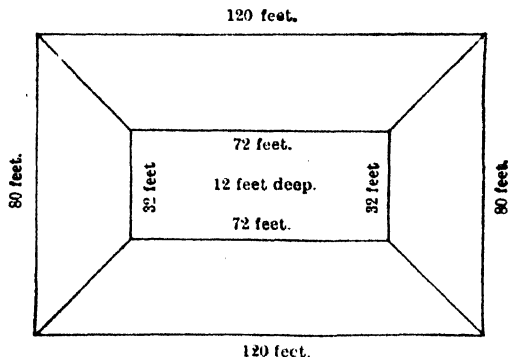
$$50 \times 3 \times 3 = 450 \text{ cubic feet.}$$

TANKS WITH SLOPING SIDES.

EXAMPLE 7.

Rule—Multiply length by breadth of top area; multiply length by breadth of bottom area; multiply sum of top and bottom length by sum of top and bottom breadth. Add these three results together, multiply by depth and divide by 6, and you have the number in cubic feet.

Divide by 27 for cubic yards.



$$\text{Top} = 120 \times 80 = 9600$$

$$\text{Bottom} = 72 \times 32 = 2304$$

$$192 \times 112 = 21504$$

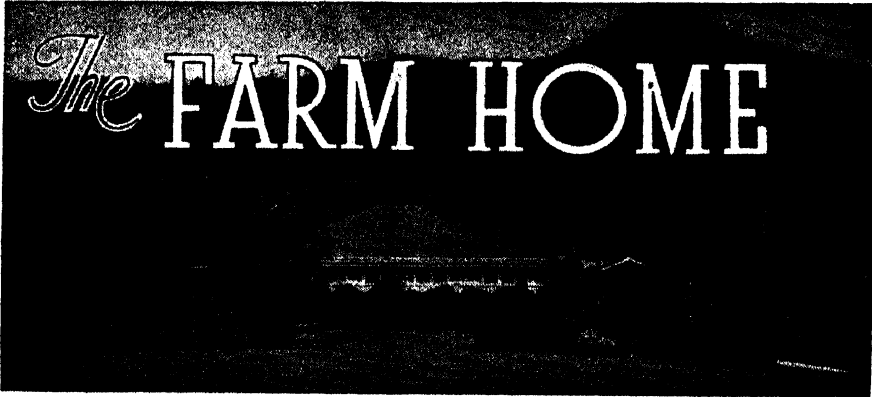
$$33408$$

$$12$$

$$6)400896$$

$$27 \left\{ \begin{array}{l} 3)66816 \text{ cubic feet} \\ 9)22272 \\ 2474.6 \end{array} \right\} 18$$

$$= 2474 \text{ cubic yds. } 18 \text{ cubic feet.}$$



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

WHEN THE CHILDREN HAVE COLDS.

Do's and Don'ts for Mothers.

MOTHERS—

- DO Keep the child's bowels regular and well opened.
- DO Keep the nostrils clear.
- DO Raise the head and shoulders a little higher than usual in the cot to make breathing easier.
- DO Give a good warm bath to open the pores of the skin and then put the child quickly into a warmed bed.
- DO Keep the child warm.
- DO Give plenty of fluids especially if he is feverish.
- DO Rub the chest and trunk with warmed oil or other similar preparation.
- DO Keep the child at home until the worst of the cold is over and so protect him from complications as well as reducing the risk of infecting others.
- DON'T Force food on the child. As long as he has plenty of drinks and fruit juices he will probably be better without too much solid food.
- DON'T Keep a child with a cold cooped up in stuffy rooms. Let him be outside if the weather is sunny and not too windy, and if inside see that the room is well ventilated. Remember that fresh air and sunshine are the best germ killers known.
- DON'T Allow the crawling baby on the floor for a few days—he may become chilled.
- DON'T Neglect to provide interesting and constructive toys for the sick child. It takes his mind off his discomfort.
- DON'T Let a cold go on indefinitely without seeking your doctor's advice, especially if there is a cough or any difficulty in breathing. If the child is feverish or drowsy or if there are any signs of ear trouble send for your doctor without delay. Many serious illnesses developing out of common colds could be prevented if taken in time.
- DON'T Wait till late at night before ringing your doctor.

Questions on this or any other matter concerning Maternal and Child Welfare will be answered by communicating personally with *The Maternal and Child Welfare Information Bureau*, 184 St. Paul's Terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

The Ever Useful Tomato.

In the present circumstances, recommendations are subject, of course, to the availability of the ingredients mentioned or of suitable substitutes.

Some Ways of Using Tomatoes—

Tomato Force meat.

Ingredients:—1 cupful tomato pulp, 1 oz. butter, 2 teaspoons finely chopped onion, 1 cup breadcrumbs, 1 egg. *Method:*—Season with pepper and salt, melt butter in saucepan, cook the onion in it without browning, add tomato pulp, cook together for 8 or 10 minutes, then allow to cool. Mix in the breadcrumbs and egg and add seasoning.

Tomato Gravy (for serving with cutlets, rissoles, or sausages).

Heat 1 tablespoon of butter in a saucepan with a little flour (about 1 dessert spoonful), brown it, stirring well so as to prevent burning, then add 1 cupful of strained tomato pulp, continue to stir until the mixture boils and is of a smooth consistency.

Sliced Tomatoes Baked.

Ingredients:—1 bottle of sliced tomatoes, breadcrumbs, mustard, pepper and salt, butter. *Method:*—Open a bottle of sliced tomatoes and drain them well. Brush each slice lightly with a little mustard which has been moistened with the tomato liquid. Season the breadcrumbs with pepper and salt and sprinkle the slices well; put them in a baking dish with small pieces of butter dotted over the surface, and bake till heated through and nicely browned. Serve very hot. Bottled whole tomatoes may be used if desired.

Fried Tomato Slices.

Ingredients:—1 bottle sliced tomatoes or fresh tomato slices, 1 egg, 1 teaspoonful of tomato liquid, pepper and salt, breadcrumbs, little plain flour, frying dripping. *Method:*—Drain the slices thoroughly, and dredge each one with a little plain flour; mix the teaspoon of tomato liquid with the egg and dip the slices quickly into it, then into the crumbs, coating them entirely; fry at once in very hot dripping or butter until nicely browned, then lift out carefully and place them to drain on kitchen paper; then transfer them to a hot dish and garnish with a little parsley. Tomatoes treated in this manner are nice for serving with fried bacon, fish, or cutlets.

Tomato Au Gratin.

Ingredients.—1 quart bottle of tomato slices or tomato pulp strained, 2 cups breadcrumbs, 2 tablespoonfuls of grated cheese, 1 tablespoonful of butter, salt and pepper. *Method:*—Put a layer of tomato slices, or tomato pulp, on the bottom of a fireproof dish; season with salt and pepper; then put a layer of breadcrumbs and a sprinkling of grated cheese. Repeat in alternate layers until all is used up. Place the butter in small pieces about the top and bake in a moderate oven. If preferred, a little grated onion and finely-chopped parsley may be mixed with the tomatoes and the cheese omitted.

Green Tomato Pickle.

Ingredients:—6 lb. green tomatoes, 2 lb. onion (sliced), $\frac{1}{4}$ lb. mustard, 2 quarts vinegar, 3 oz. whole ginger, $\frac{1}{2}$ lb. sugar, 1 tablespoon cloves, 2 rounded tablespoons flour, 1 rounded teaspoon tumeric. *Method:*—Slice the tomatoes and onions, and sprinkle moderately with salt, place a plate on top and allow to remain overnight. Next day, drain the water which the salt has extracted, and put the vegetables into a preserving pan with the vinegar, sugar, and spices (the latter tied in a muslin bag); simmer together for about 20 minutes, and then remove the spice bag. Mix the mustard, tumeric, and flour, with a little cold vinegar, and stir it into the pickles; continue the cooking for 10 minutes or so; then bottle while hot.

Green Tomato Chutney.

Ingredients:—12 lb. green tomatoes, 2 lb. onions, 3 lb. sugar, $1\frac{1}{2}$ oz. ginger, $\frac{1}{2}$ oz. cloves, $\frac{1}{2}$ oz. wholespice, $\frac{1}{2}$ oz. peppercorns, 1 teaspoonful mustard, 2 quarts vinegar. *Method:*—Cut the tomatoes into about four sections, sprinkle with salt, and allow to remain 24 hours or so, then drain off the water which the salt has drawn. Meanwhile, spice and sweeten the vinegar, and put the drained tomatoes and onions into it, cooking until well blended.

JULY WEATHER IN QUEENSLAND.

Over average district rainfall figures in most Divisions were mainly due to a State-wide rain distribution, under out-of-season monsoonal influences, during the second week. Other rains were mostly confined to the usual scattered showers along the coastal fringe and some other useful shower periods which consolidated and enhanced the earlier recovery in agricultural and dairying seasonal prospects throughout the Downs and South Coastal Divisions. In the Carpentaria Divisions totals of $1\frac{1}{2}$ to approximately 3 inches were heavy enough to be useful, but rains in sections of the central Lowlands, Highlands and Central Coast, as well as a narrow strip along the border Hebel to Wallangarra, were under average. Most of the Central and North Coast areas have also been dry since February and March. In the dry to drought areas of the Warrego and Maranoa the mid-month rains aggregated approximately $1\frac{1}{2}$ to 2 inches, temporarily useful, but in general hardly sufficient to promote much pasture growth with intervening spells of cold weather. Additional early rains and milder temperatures are required to re-establish normal spring conditions.

Temperatures.—Average maximum temperatures were 2 to 3 degrees below in the Tropical Interior, otherwise ranged from normal to 2 degrees above, 3 degrees at Thargomindah. Minimum temperatures ranged from normal to 2 and 3 degrees above, up to 4 degrees at Mitchell and Stanthorpe despite some sharp frost periods in the central and southern sections of the State.

The rain position is summarised below:—

Division.	Normal Mean.	Mean July, 1944.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	42	156	271 above
Peninsula South	24	207	763 "
Lower Carpentaria	20	238	1,090 "
Upper Carpentaria	42	167	298 "
North Coast, Barron	114	239	110 "
North Coast, Herbert	179	285	59 "
Central Coast, East	111	121	9 "
Central Coast, West	65	123	89 "
Central Highlands	116	102	12 below
Central Lowlands	82	83	1 above
Upper Western	41	133	224 "
Lower Western	51	88	73 "
South Coast, Port Curtis	178	207	16 "
South Coast, Moreton	227	475	109 "
Darling Downs East	181	249	38 "
Darling Downs West	141	204	45 "
Maranoa	147	199	35 "
Warrego	107	152	42 "
Far South-West	69	80	16 "

Commonwealth Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA.**STANDARD TIMES FOR BRISBANE.**

Date, 1944.	Sunrise.	Sunset.	Moonrise.	Moonset.	Date, 1944.	Sunrise.	Sunset.	Moonrise.	Moonset.
Aug. 1	a.m. 6.30	p.m. 5.18	p.m. 2.00	a.m. 3.01	Aug. 17	a.m. 6.18	p.m. 5.26	a.m. 5.06	p.m. 3.59
2	6.30	5.18	2.55	4.01	18	6.17	5.27	5.49	4.53
3	6.29	5.19	3.56	5.01	19	6.16	5.27	6.28	5.46
4	6.28	5.19	5.01	5.58	20	6.15	5.28	7.04	6.38
5	6.28	5.20	6.08	6.51	21	6.14	5.28	7.38	7.29
6	6.27	5.21	7.16	7.41	22	6.14	5.29	8.10	8.20
7	6.26	5.21	8.23	8.26	23	6.13	5.29	8.42	9.12
8	6.26	5.22	9.28	9.08	24	6.12	5.30	9.14	10.03
9	6.25	5.22	10.32	9.48	25	6.11	5.30	9.48	10.56
10	6.24	5.23	11.34	10.28	26	6.10	5.31	10.24	11.51
11	6.23	5.23	..	11.09	27	6.09	5.31	11.04	..
12	6.22	5.24	a.m. 12.35	11.51	28	6.08	5.31	11.49	a.m. 12.48
13	6.22	5.24	1.34	p.m. 12.36	29	6.07	5.32	p.m. 12.39	1.46
14	6.21	5.25	2.32	1.28	30	6.05	5.32	1.36	2.44
15	6.20	5.25	3.27	2.13	31	6.04	5.33	2.39	3.41
16	6.19	5.26	4.18	3.06					

PHASES OF THE MOON.

Full Moon .. Aug. 4th 10.39 p.m. New Moon .. Aug. 19th 6.25 a.m.
 Last Quarter .. Aug. 11th 12.52 p.m. First Quarter .. Aug. 27th 9.39 a.m.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JUNE RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	June.	No. of years' records.	June, 1944.	June, 1943.		June.	No. of years' records.	June, 1944.	June, 1943.
<i>North Coast.</i>	In.		In.		<i>South Coast—contd.</i>	In.		In.	
Atherton	1.71	43	4.19	1.06	Gatton College	1.72	44	0.62	1.00
Cairns	2.86	62	5.22	0.98	Gayndah	1.82	73	0.46	1.61
Cardwell	2.07	72	4.05	1.30	Gympie	2.58	74	1.72	1.36
Cooktown	2.06	68	3.42	0.52	Kilkivan	2.12	63	0.85	1.27
Herberton	1.18	58	2.53	0.78	Maryborough	2.90	73	2.13	1.26
Ingham	2.46	52	3.44	1.32	Nambour	3.65	48	3.30	1.79
Innisfail	7.41	62	15.73	4.27	Nanango	1.94	62	1.04	1.32
Mossman	2.95	20	4.80	2.61	Rockhampton	2.50	73	0.91	1.99
Townsville	1.38	72	0.46	0.99	Woodford	2.75	57	1.72	1.32
<i>Central Coast.</i>					<i>Central Highlands.</i>				
Ayr	1.48	57	0.56	1.39	Clermont	1.67	73	0.50	0.91
Bowen	1.65	73	0.94	2.12	Springsure	1.75	75	0.62	0.87
Charters Towers	1.20	62	0.42	0.33	<i>Darling Downs.</i>				
Mackay	2.74	73	2.89	3.40	Dalby	1.62	74	0.89	0.81
Proserpine	3.22	41	3.26	3.08	Erna Vale	1.43	48	0.67	0.61
St. Lawrence	2.45	73	1.65	1.59	Jimbour	1.53	65	0.80	1.59
<i>South Coast.</i>					Miles	1.68	59	1.34	0.86
Biggenden	2.15	45	0.55	1.53	Stanthorpe	1.86	71	0.95	0.81
Bundaberg	2.77	61	1.11	1.29	Toowoomba	2.31	72	0.84	0.90
Brisbane	2.60	92	0.90	1.21	Warwick	1.69	79	0.15	0.77
Caboolture	2.72	68	2.27	1.28	<i>Maranoa.</i>				
Childers	2.39	49	0.92	1.96	St. George	1.48	63	0.85	1.14
Columhurst	4.29	50	2.67	1.87	Roma	1.49	70	1.47	1.36
Esk	2.12	57	0.52	1.51					

CLIMATOLOGICAL TABLE FOR JUNE, 1944.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	SHADE TEMPERATURE.		EXTREMES OF SHADE TEMPERATURE.				RAINFALL.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
<i>Coastal.</i>	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns .. ..	..	76	68	79	9, 15, 16	57	20	522	19
Herberton .. ..	..	67	52	72	11, 12	35	20	253	16
Townsville .. ..	..	77	60	81	11	44	20	46	5
Brisbane	30.18	69	51	74.6	4	41.4	22	90	7
<i>Darling Downs.</i>									
Dalby .. ..	..	67	40	75	9	27	22	89	3
Stanthorpe .. ..	..	60	33	68	10	19	21	95	4
Toowoomba .. ..	..	61	44	65	8, 10, 16	37	20, 21, 29	84	7
<i>Mid-Interior.</i>									
Georgetown	30.02	81	..	89	21	..	..	32	2
Longreach	30.23	75	49	82	24	38	20	1	1
Mitchell	30.30	67	39	75	10	25	22	89	4
<i>Western.</i>									
Burketown .. ..	..	81	60	86	6, 14	51	19, 22	197	5
Boulia	30.15	73	47	82	6	38	23	Nil	..
Thargomindah	30.27	67	45	77	7	37	19, 20	7	2

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.



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QUEENSLAND AGRICULTURAL JOURNAL

Edited by
J. F. F. REID

Associate Editor
C. W. WINDERS, B.Sc.Agr.



SEPTEMBER, 1944

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ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



QUEENSLAND AGRICULTURAL JOURNAL

Volume 59

1 SEPTEMBER, 1944

Part 3

Event and Comment.

Soil Surveys Before Settlement.

IN a general rural survey which constitutes the First Report of the Rural Reconstruction Commission factors influencing costs of production are discussed, including the growing of crops in the wrong places. One of the first essentials of success in any farming enterprise is that it shall be located in the right place, that is where soils, topography and climate are suitable. In discussing this point, the Commission states, *inter alia* :—

In the past many land settlement schemes have been prepared by trained surveyors many of whom have a practical knowledge of soils and vegetation they bear in relation to agricultural potentiality. For soils which have no exceptional features this method of survey is successful, but, in the case of new types of soil and in areas where especial difficulties (*e.g.*, deficiencies of "minor" elements) occur, the lack of scientific experience has often led to farming disaster and, unfortunately, in some cases where knowledge was available, it was not used as it should have been. Rice and citrus growing offer instances of the close relation which exists between scientific soil type and successful production. Permanent success of the former is only achieved where soils are heavy and impermeable, while the cultivation of the navel orange is seldom completely successful except on one or two very special soil types. It was urged on the Commission, in the course of its investigation, not to encourage any new plantings of citrus groves except on the correct soils, as groves in the wrong place or in the wrong district were bound to have low yields and high costs There are many other instances where farmers have continued for a long time to carry on farming on soils not particularly suited to the crops they are growing, with resultant high costs and poor financial

returns. The Commission therefore considers that much more attention should be paid in future to the scientific survey of the soils of any area considered desirable for land settlement, and that settlement should not be planned until the suitability of the soil for the intended type of agriculture has been assured.

More Butter and Cheese Urgently Needed.

UP to the present, dairy farmers have done a very fine job in face of difficulties of transport, wartime shortages of many things they need most and with much less help, to say nothing of seasonal worries. Probably no section of the community has responded more readily to the calls which have been made on it than the dairy industry. Normal production, however, is not enough to meet the heavy and growing demands of Australia's fighting men, those of our Allies, the people of Britain, and our own civilian population. One more pint of milk a day from every cow now in profit would more than supply the present required increase in production.

In the same way as the nation appealed successfully to the young men and girls who have joined the Forces and to all other sections to exert every effort in the cause of Australia and other of the United Nations, it is now appealing confidently to the dairy industry. Victory is assured, but how long it will take to achieve depends very largely on an adequate food supply—and dairy products to-day are among the foodstuffs needed most urgently. It is not a question of guns or butter, but butter for the gunners. So another pint of milk from every cow in milk will help to bring the day of victory nearer and succour to the starving populations in the devastated countries who appeal so strongly to our common humanity.

Leadership in the Land Industries.

STRONG leadership in agriculture generally, but particularly in agricultural organisation, is a clamant need of the present time. No one can do a job better than the man most interested in getting the job done. Yet, in leadership, there is something more required than regard for one's own occupational interest, including a balanced adjustment of all interests. With their wide background and the wholesome traditions of the open country, leaders from the land can bring to their national job a breadth of view, a judicious balance and a tolerant understanding. As in other days Cincinnatus was called from the plough to lead his country in time of crisis, there are probably many young potential leaders who may be called from the tractor, or who may come home from active service with the fighting forces, to give the leadership which is required and who may be well aware of—

“That impulse Agriculture gave
To human progress everywhere
On solid land and rolling wave
And in the air.”

As now, when the war is over there will be a tremendous demand on capacity for leadership in rural industries. Ability to grow things is not enough, and payable and stable markets for what is grown should be a first consideration. To marshal our farming resources and produce with confidence will be easy, if we master the problems of marketing and distribution.



The Peanut.

J. A. KERR.

THE peanut plant is a source of highly nutritious food both for human beings and for farm livestock. The uses to which the crop is put are many, and its importance is steadily increasing. As a human food, the kernel itself is consumed raw, salted, or roasted; it is used in various forms of confectionery and in margarine manufacture, and is also marketed as peanut paste and oil. As a stock food, peanut meal contains up to 48 per cent. crude protein and ranks as a high-grade palatable product. The crop may be eaten down by pigs, but its consumption by them will result in objectionable qualities in the carcasses. Breeding sows and weaners, however, may be fed limited amounts without detriment. The tops of the plant make a useful though rather coarse hay, which is inferior to cowpea hay both in yield and protein content. The residue of the crop, after threshing to remove the nuts, is often stacked as reserve fodder.

The peanut is regarded as being a native of Brazil, where several closely allied species are found. It is an annual summer-growing plant which is easily killed by frost, but it will otherwise adapt itself to a

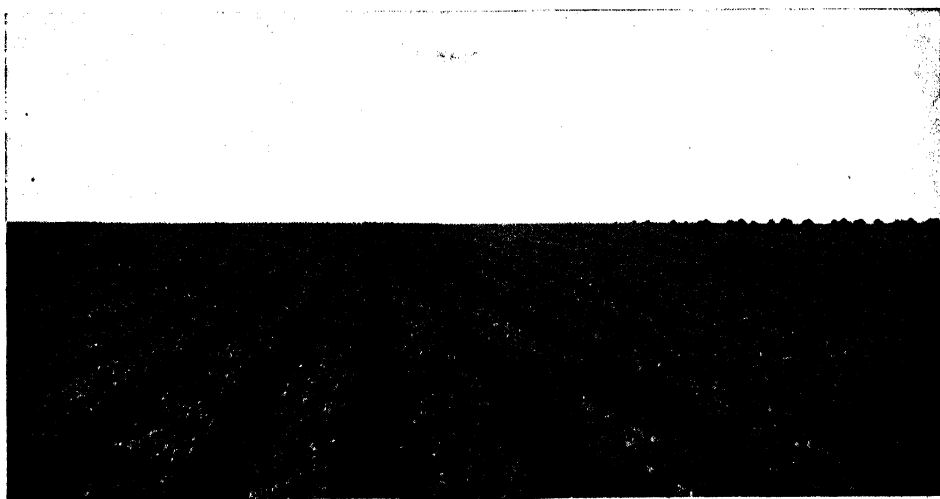


Plate 45.

A MATURE PEANUT CROP IN THE SOUTH BURNETT DISTRICT.

wide range of climate, provided soil conditions are favourable. Moderate rainfall, abundance of sunlight, and comparatively high temperatures give the best results with this crop.

The flavour of the kernel and the type of the shell enclosing it have led to the fruit of the peanut plant being incorrectly known as a nut; however, as the plant belongs to the pea family, the fruit is really a pod. Like other members of that family, the roots bear numerous nodules containing bacteria which make nitrogen in the air available to the plant.

The plants (Plate 45) grow to a height of from 12 to 18 inches and may be of either a bunched or a running habit, the former type being preferred. Owing to its less straggly habit of growth, cultivation of the bunched type of peanut is much easier and harvesting is very much simpler than in the case of a variety possessing a running habit.

The flowers, which are small and yellow, are borne in the axils of the leaves. After pollination, the flower stalk elongates, bends downwards, and carries the developing pod into the soil. This flower stalk is commonly known as a peg, and the pod does not develop unless the peg penetrates the soil.

The period of growth in the case of peanuts varies from sixteen to twenty-two weeks, according to the variety grown, the district in which it is grown, and the seasonal conditions experienced during the growth of the crop. Early maturity is usually characteristic of the upright or Spanish type of plants.

The yield of peanuts per acre will naturally vary greatly with the soil fertility and with the climatic conditions experienced during growth. Yields of as much as 180 bushels per acre are obtained when conditions are ideal, but 75 bushels per acre may be regarded as an average. The

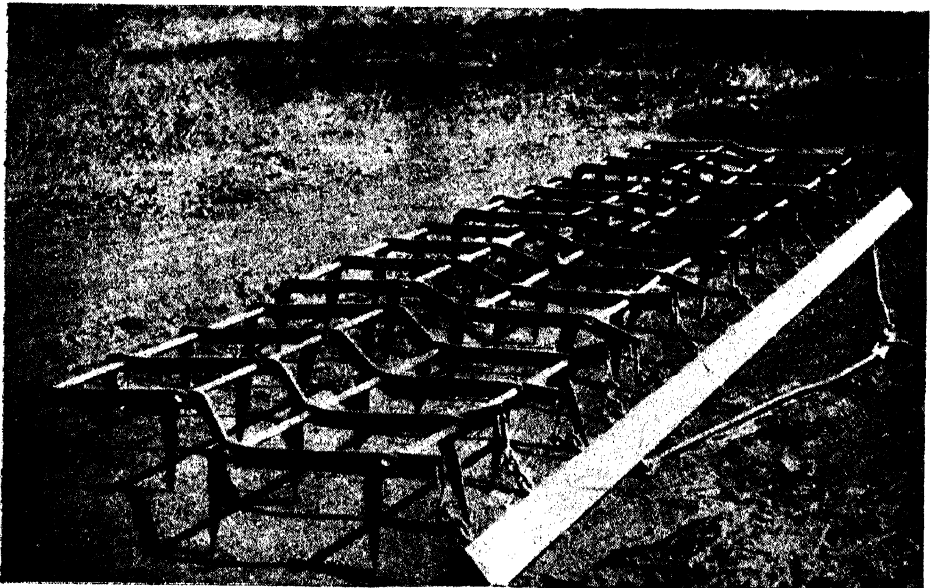


Plate 46.
A PEANUT HARROW.

average bushel weight of peanuts as delivered by the thresher is 17 lb. for the Virginia Bunch variety and 22 lb. for the Red Spanish variety.

Suitable Soils.

Well-drained, open-textured soils with a high humus content are the most suitable types for the growth of this crop. However, satisfactory crops can be grown on a wide range of soils, but heavy soils which are inclined to become hard and compact should be avoided. Heavy soils frequently produce large crops of peanuts, but considerable losses are experienced on them when harvesting, particularly in varieties which readily shed the pods. Other things being equal, sandy loams usually produce the best results.

Rotations for Peanuts.

Observations indicate that the first crop of peanuts on a soil is usually particularly good, yields of as much as 120 bushels per acre being frequently obtained. Uninterrupted cropping with peanuts, however, reduces the yield to an uneconomic level within a few seasons, and in few crops grown under Queensland conditions is a suitable rotation so essential to the maintenance of a satisfactory standard of production.

The eradication of all weeds in the growing crop, which is essential for the successful production of peanuts, combined with the method of harvesting, entailing as it does the removal of practically the whole plant, results in a serious lowering of the humus content of the soil, with a consequent adverse effect on its physical structure. The combined effect thereof is reflected in reduced yields. An undesirable variation in the ratio between the different soil nutrients following continuous cropping with peanuts is probably also responsible for a reduction in yield.

The selection of suitable crops for rotation with peanuts depends upon the type of farming practised, but where dairying is combined with peanut-growing the problem is somewhat simplified. Queensland climatic conditions are such that the main selections must be made from summer crops, supplemented, however, where possible, by winter crops. Maize, grain sorghums, saccharine sorghums, Sudan grass, white panicum, Japanese millet, and potatoes provide some of the possible selections for summer growth. Cowpeas should also be included in the rotation, but there is some evidence to the effect that they should precede the abovementioned fodder crops rather than the peanut crop. All residues of ordinary crops included in the rotation should be ploughed in, and in the case of the more open soils a bulky fibrous crop, such as Sudan grass, should be included in the rotation and ploughed in as a green manure prior to the planting of the peanut crop. The beneficial results obtained from Rhodes grass as a soil renovator, as indicated by first-crop peanut returns following that grass, suggests the adoption of the practice of grassing available cultivation areas from time to time for periods of from two to three years.

The restriction of peanut-growing to one crop in three years, or to two crops in five or seven years, may prove to be necessary if satisfactory production is to be maintained. The benefits of the rotation will not be limited to the peanuts, but will also be apparent in the other crops which are included in the cropping programme. A rotation, however, must be adopted at an early stage in the utilisation of a farm in order

to achieve the highest degree of maintenance of soil fertility, and not merely as a measure adopted at a later date to restore the fertility of soils which have been mined rather than farmed. The use of appropriate fertilizers may prove to be necessary and economically sound in rotation, but fertilizers alone will not be sufficient, and planned rotations, suited to the district and the soil, must be adopted.

Soil Preparation.

A field comparatively free from weeds should be selected for the production of peanuts in order to reduce hand work in the growing crop, and cultivation prior to planting should be thorough. If no cover crop is being grown during the winter, the first ploughing should be completed by May or June and should be across the slope of the land, which is then allowed to lie in a rough state until spring. Spring ploughing should then be followed by cultivation with the object of producing a loose, fairly fine seed-bed and conserving moisture. A further ploughing may be necessary, but the amount of cultivation required will naturally vary with the soil type and with the weather conditions.



Plate 47.

A PEANUT CUTTER.

Varieties.

Only two varieties are grown extensively in Queensland, these being the Virginia Bunch and the Red Spanish. The former is a strong-growing variety, and produces a large quantity of dark-green foliage. Virginia Bunch plants, on suitable soils, may reach a height of 12 to 18 inches and a diameter of from 24 to 30 inches. The pods are usually borne fairly close to the centre of the plant, but late flowers may

develop and fruit along almost the whole length of the branches. The pods are fairly smooth, of good size and shape, and usually contain two pale-coloured kernels. On maturity, these pods generally break off easily, thus resulting in loss in cases in which harvesting is delayed. Peanuts of the best quality of this variety are usually reserved for the "whole nut" trade. The Red Spanish variety is a smaller plant of semi-erect, bushy habit, with light-green foliage. Its pods, which are closely clustered round the main stem, are small and completely filled with two dark-red kernels. On maturity, they do not break off easily, and so do not present a harvesting problem, as may be the case with the Virginia Bunch variety. On account of their high oil content, Red Spanish kernels are frequently used for the oil trade, but they are also used for the manufacture of peanut paste and are consumed as salted and devilled kernels.

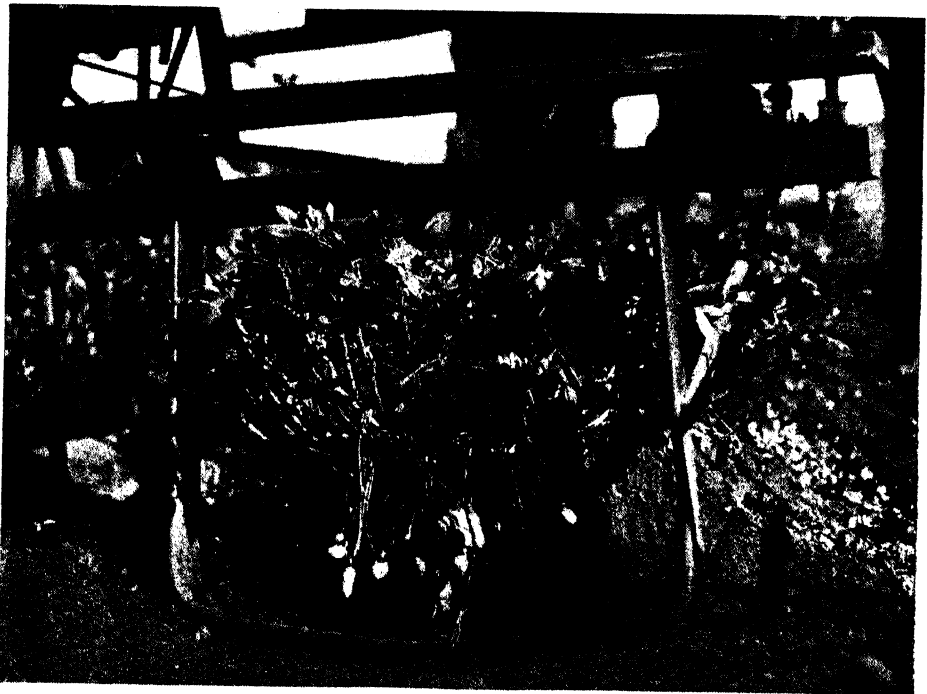


Plate 48.

A CLOSE-UP VIEW OF A HILL OF PEANUTS WITH THE SOIL PARTIALLY REMOVED, TO SHOW HOW THE BLADE OF THE PEANUT CUTTER PASSES UNDER THE HILL.

Planting.

The planting season extends from October to January, inclusive, the later date of planting being usual in the north. Peanut planters and maize drills fitted with special peanut plates operate in a very satisfactory manner for planting. These mechanical planters plant shelled seed only, and, with them, even-graded seed is necessary to ensure the fairly regular spacing of plants. Small areas may also be planted by hand in shallow furrows opened at the desired spacing of the rows. When planting is done by hand, the use of shelled seed is not essential. The whole pod or the pod broken in halves may, therefore, be used, but the germination thereof is slower than is the

case with shelled seed. Soaking of the pods prior to planting may prove to be advantageous. A width of 36 inches between the rows and a plant spacing in the row of from 15 to 21 inches is recommended for the Virginia Bunch variety, this spacing requiring approximately 25 lb. of seed per acre. For the Red Spanish variety, a width of from 30 to 36 inches between the rows with a plant spacing of from 8 to 15 inches in the row is recommended. The seed of the Red Spanish variety is smaller than that of the Virginia Bunch, and approximately the same sowing rate, 20 to 25 lb. per acre, is therefore adequate for the closer spacing usually adopted in the case of the former variety. The seed should be sown at a depth of 2 to 3 inches.

The treatment of Virginia Bunch seed with Ceresan, Agrosan, or similar organic mercury dusts, is very desirable in order to ensure satisfactory germination.

Cultivation of the Crop.

Crop cultivation for the first month after planting may be carried out with light peanut harrows (Plate 46) dragged across the rows. Ordinary light lever harrows may also be used. The initial harrowing may be done shortly after the first plants appear, and the judicious use of the harrows in this early stage of the growth of the crop considerably reduces later hand work, by virtue of the fact that the harrowing eradicates many weeds in the row. Inter-row cultivation should be continued until the first pods are developing. At least one hand chipping will probably be necessary to ensure the eradication of



Plate 49.

CAPPING A STOOK OF PEANUT PLANTS.

weeds. During the last cultivation a slight hilling is frequently given with the object of providing a free entrance for the fruiting pegs.

Harvesting and Marketing.

As the peanut crop does not mature evenly, harvesting is carried out when the majority of the pods are mature. The plants at that stage usually develop a yellowing of the foliage, but as that is not invariably the case, an examination of the pods is necessary before a decision is made to harvest the crop. The inside of the shell usually begins to colour, at least at one end, and shows darkened veins when



Plate 50.
A STOOKED PEANUT CROP DRYING FOR THRESHING.

maturity has been reached. In the case of the Virginia Bunch variety, a few of the early pods are usually lost, but no difficulty in this respect is experienced with the Red Spanish variety, which retains its pods for a considerable period after they have reached maturity.

Before pulling the plants, the taproot may be cut by a blade attached to a cultivator frame; the blade employed for such a purpose is usually about 30 inches long, and is adjusted to cut just below the level



Plate 51.
THRESHING PEANUTS IN THE SOUTH BURNETT DISTRICT.

of the pods (Plates 47 and 48). A single-furrow mouldboard plough with the mouldboard removed also acts as a fairly satisfactory cutter, but the attachment of a special share with an extended blade improves the cutting. The action of cutting also loosens the soil around the plants and thereby facilitates pulling.

After cutting, the plants are pulled by hand and placed in bundles of a size convenient for handling when stooking, the soil being simultaneously shaken from the plants. Combined mechanical cutters and pullers have so far not proved satisfactory.

The usual practice is to stook the plants without support. The plants from eight to twelve rows are generally placed in a single line of stooks, the average size of the stooks being about 30 inches in diameter and 3 feet in height. The first plants are placed on the ground with the pods upwards, followed by some other outer plants with the pods towards the centre. The stooks can then be built in successive layers, each bundle of plants being firmly placed in position with the pods always to the centre of the stook. The last 12 inches are tapered to a point and capped by a plant with the foliage directed downwards with the object of shedding as much rain as possible.

Stacking around poles is rarely adopted in Queensland for curing the crop prior to threshing. For that purpose, poles about 7 feet long are driven firmly into the ground and two cross-pieces 3 feet long are nailed on to the poles at right angles to each other about 9 inches from the ground. The first plants are placed on these cross-pieces in order to keep the pods off the ground, and the stack is then built round the pole with the pods inside. Towards the top of the pole the plants are so arranged as to gradually taper off the stook, which is capped by using inverted peanut plants or grass. From twenty to thirty poles are required per acre for curing the crop in this manner.

Dry weather is essential for the first week after pulling, in order to allow the plants to dry, but after that period has elapsed rain damage is usually of minor importance, unless continued for long periods. Unfavourable harvesting weather produces a darkening of the pods, and moulds may develop under such conditions, with a consequent loss of quality, and they may even cause the destruction of a large percentage of the crop.

The peanut plants may remain in the stooks for a period of from fourteen to twenty-eight days, the duration of the period depending on the prevailing weather conditions. The plants must be dry and the pods must shatter easily from the pegs before threshing is attempted. Threshing is usually done by contractors who operate machines designed for handling this crop. The stooks are generally conveyed on low waggons to the thresher, which is moved from time to time to convenient positions in the field. The plant residue, after the thresher has removed the pods, is frequently stacked in the field in the position in which it is delivered from the threshing machine, and is subsequently used as fodder.

Associated with the marketing of this crop is the Peanut Board, which was established in 1924. Since then, the Board has erected and now controls extensive silos, shelling and cleaning machinery, and other equipment. The main storage facilities are provided at Kingaroy, but there are also Board depots at Brisbane, Atherton, and Rockhampton.

Cowpea.

A. HAMILTON.

THE cowpea is a vigorous growing summer annual, most varieties of which produce long runners of a twining habit of growth although some are of a more erect bushy nature with tendrils only a few inches in length. Like other legumes it has the power of growing in association with certain nitrogen fixing bacteria. When such an association is established, characteristic nodules are developed on the roots and inside these nodules the bacteria absorb nitrogen from the air and pass it on to the plant. It is important to note that effective nodulation is achieved only when nodules are well developed on the tap root and main branches as well as elsewhere on the rooting system.

The use of cowpea for green manuring purposes is perhaps one of the oldest of farming practices, its value as a green manure having been appreciated for centuries. It is used most extensively in Queensland for this purpose, especially in the sugar-growing districts, and while it is also used for haymaking and grazing, it is not yet used, particularly for grazing, to anything like the extent it should be. It is frequently stated that difficulty is experienced in getting dairy stock to graze cowpea while in a green state, but as a rule stock do not take long to acquire a taste for it and they then eat the crop with relish. To accustom stock to the crop it has been found a good practice to sow a light sprinkling of maize with the cowpea seed. The cowpea vines twine round the maize plants and the stock, in singling out the maize plants, cannot avoid also eating some of the cowpea vines and thus acquire a taste for them. Cowpea is also of value for silage making, although when used alone it does not make good silage; it is, however, excellent for mixing with other silage crops such as maize or sorghum. Finally the value of the immature cowpea pods as a green vegetable is not by any means fully appreciated; they are an excellent substitute for ordinary culinary beans.

The plant, being of tropical origin, thrives and produces its heaviest growth under warm moist conditions. Nevertheless, cowpea has a marked capacity to survive dry spells once the plants are established, and will produce fodder during seasons when many other crops fail. The crop is very susceptible to frost and this should be borne in mind when arranging planting dates. Cowpea may be grown successfully on a wide range of soils, but it is not recommended for low-lying, poorly aerated land. It is particularly valuable both on poor sandy soils and where erosion has impoverished hill soils. It serves to build up the fertility of such land sufficiently to enable it to produce suitable crops requiring considerable supplies of nitrogen.

Preparation of Seed-bed.

The cowpea, like all other crops, responds to good cultivation and gives results in proportion to the care with which the seed-bed has been prepared. An early and thorough preparation of the land is necessary to obtain the best results, and the same treatment should be afforded the land as is given for maize. When this is done, a fine, firm seed-bed should result and this will contribute greatly towards a good germination.

Sowing.

The best time to sow cowpea depends on the locality and also on the purpose for which the crop is to be grown. When it is required for haymaking purposes, it is essential that sowing be so arranged that the crop will be in the correct stage for converting into hay at a time of the year when fine weather can be expected. In most districts, about mid-December will be found to be a very suitable time for sowing as a green manure, as a hay crop, or as a grazing crop; if, however, it is required for seed production, sowing is best deferred to the end of December.

When required as a green manure or for grazing or haymaking the seed is frequently sown broadcast, but when the crop is grown for seed purposes it is necessary to sow it in rows just wide enough apart to permit of inter-row cultivation, the usual spacing being 2 feet 6 inches between the rows. It is very doubtful, however, if broadcast sowing has any advantages over drill sowing no matter for what purpose the crop is grown. Much less seed is required where the latter method is adopted, inter-row cultivation keeps weed growth in check until the plants are established, and at least the same bulk of green material is produced. Broadcast sowing should be carried out only on land on which the young plants will not have to contend with heavy weed growth, and also only when weather and soil moisture conditions are favourable. Broadcasting should be carried out while the land is in a rough state just after the last ploughing and should be followed immediately by a good harrowing. When sown on a rough surface a much better cover of seed can be effected than when it is sown on land with a well-worked even surface. An ordinary single or double row planter is very suitable for sowing, the seed being sown at a depth of approximately 2 inches.

The sowing rate varies considerably owing to variation in the size of the seed and from 8 to 15 lb. per acre is required when sown in drills 2 feet 6 inches apart and from 30 to 50 lb. per acre when sown broadcast. The quantities given are for coastal districts and those districts which usually are favoured with good summer rains, but for inland districts the quantities of seed per acre could be reduced somewhat.

Occasionally cowpea is sown as a mixture with maize or sorghum (Plate 52) on the Atherton Tableland when required for silage purposes, but this method cannot be recommended as a general practice throughout the State as it will be found that usually a greater weight of material per acre is obtained when the crops have been grown separately. Harvesting is also simplified because a combined crop of maize or sorghum and cowpea is frequently very difficult to handle.

Varieties.

Poona is an upright growing, moderately late variety which, owing to the hardiness associated with its deep root system, its favourable habit of growth and prolificness is universally favoured for silage, green manuring, or haymaking. The seed, which is the smallest of any cowpea in general cultivation, is a light clay colour and is produced in large quantities in short pods. This variety possesses the undesirable habit of maturing its pods unevenly and seed harvesting is accordingly



Plate 52.
SORGHUM AND GROIT COWPEA.

difficult. Less than half the ordinary amount of seed per acre of this variety is sufficient for sowing purposes.

Victor (Plate 53) is a very prolific, tall, half-bushy variety which produces a great bulk of leaf and vine and is thus very suitable for green manuring and haymaking purposes. The medium-sized seed, which is produced in large quantities, is buff coloured, with a brown marbling, and is sprinkled with very small blue specks.

A medium late, tall, half bushy variety is Brabham, which is a prolific seeder and produces a large mass of vine and foliage. The roundish seed has markings similar to those of Victor and is borne in long white pods. It is suitable for green manuring purposes.

Black is a moderately late somewhat prostrate variety, which, under favourable conditions, gives a heavy yield of vine and seed. For these reasons it has been for many years one of the most favoured varieties for green manuring purposes. It produces large pods which, as its name suggests, contain large black seed.

The Mammoth or Giant variety has derived its common name from its very large clay-coloured seed. It is a late maturing, rather prostrate variety which freely produces a coarse vine and foliage and is used fairly extensively in some localities for green manuring purposes. It is a moderately shy bearer. Double the amount of seed per acre that is normally required for sowing cowpea must be used in the case of this variety because of the great size of its seed.

The Groit cowpea is another late-maturing variety with a semi-upright habit of growth which enables it to climb any available support. It is a vigorous grower, but is finer in the stem than the Mammoth or Giant variety, and produces a heavy mass of vine and foliage, but not so much as does the latter variety. It may be used for green manuring purposes. The seed coat markings are similar to those described for Victor.

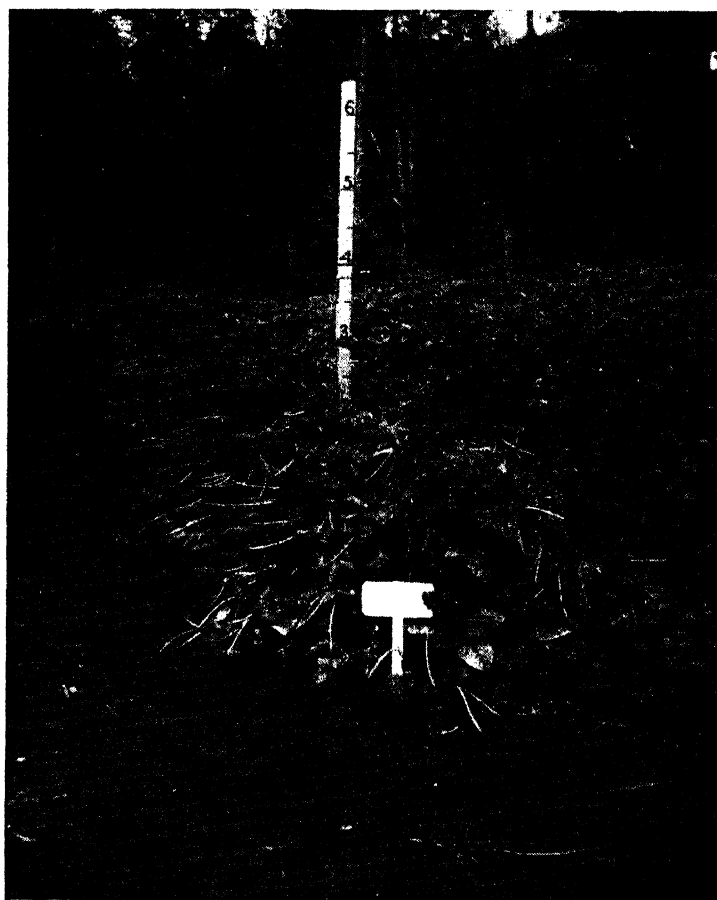


Plate 53.
VICTOR COWPEA.

One of the earliest-maturing varieties is Black-eyed Susan, but owing to its comparatively poor habit of growth it is not used as a green manure. The seed, which is produced in moderate quantities, is of medium size and is white with a black patch surrounding the seed scar which marks the point at which the seed was attached to the seed pod. It is suitable, when in a dry ripe state, for culinary purposes, cooked like ordinary dried peas.

Clay is a small variety which was once one of the most favoured varieties in this State, but it has long been superseded by more prolific types.

Both Victor and Poona are resistant to nematode infestation, and Brabham also has some merit in this respect but to a lesser degree; the status of other cowpea varieties with respect to nematode attack in Queensland is not yet quite clear.

Green Manure.

When cowpea has been grown as a green manure (Plate 54), the crop should be ploughed under when the pods are well formed but

before they have commenced to ripen. Difficulty may be encountered in ploughing under a heavy crop, but that difficulty can be largely overcome if a disc harrow or similar type of implement is used to flatten and partly chop the vines just prior to ploughing. Where a disc harrow is not available, a roller may be used to advantage, the crop being rolled down in the direction in which the plough will follow—i.e., one half of the land should be rolled in one direction, say, north, and the other half in the opposite—i.e., southerly direction. The plough should follow the roller as soon as possible and while the vines are still fresh and green.



Plate 54.

A COWPEA CROP ON A NORTH QUEENSLAND FARM.

The soil should be in a well-moistened condition at the time the crop is ploughed under as it is difficult to get a good cover in dry soil, and furthermore, what little soil moisture is present in a dry or slightly moistened soil will largely be lost as a result of the ploughing, and the decomposition of the vines will thereby be seriously delayed.

A disc plough is much more satisfactory than a mouldboard plough for turning the crop under, especially for crops which have not previously been treated by discing or rolling. Rolling the land, immediately after ploughing under has been completed, will usually accelerate decomposition and is therefore recommended except, of course, on soils on which it is not advisable to use a roller.

Haymaking.

Cowpea makes a nutritious hay which is readily eaten by stock, but great care is necessary during curing in order to reduce the moisture content of the stems sufficiently to permit of safe storage, and at the same time retain the leaf. Providing a suitable variety is used and the crop was sown thickly enough to encourage the production of fine stems,

a good-quality hay can be made with ordinary care. The crop should be cut when the pods are fully developed but before they commence to ripen.

Harvesting for Seed.

Crops required for seed purposes are usually sown in rows to facilitate harvesting. The general practice is either to pull the vines by hand or to cut their main stems with a cane knife or other suitable tool and then to roll them into heaps. Owing to the twining nature of the vines, cutting the crop with a mower is very difficult unless a special side attachment is affixed to the mower, and even then, much wastage usually occurs.

The crop is allowed to remain in the field in small heaps until cured, when threshing may be carried out straight away or the crop may be stacked to be threshed at some future date. When dealing with comparatively small areas, the usual method of threshing is with a flail, but for large areas machine threshing is at times resorted to. However, when an ordinary thresher is used great care is necessary to make the required adjustments, otherwise a large percentage of the seed will be cracked or destroyed.

Cowpea seed is very susceptible to damage by pea and bean weevils, and the usual precautions which are taken when storing other grain should also be taken in this case.

ROTATIONS WITH SORGHUMS.

Sorghums are sometimes considered to excessively deplete the fertility of soils, as non-leguminous crops following sorghums frequently yield less than normally anticipated. Other theories have suggested that the sorghum roots, during the growth of the plant, secrete a substance that is toxic or slightly poisonous to the following crops, as evidenced by the light, yellowish-green leaves of such crops, especially on soils that normally have a low nitrogen content, or on various types of soils in dry seasons.

Investigations in the United States of America indicate that the reductions in the yield of non-leguminous crops following sorghums are mostly due to the depletion of the nitrate nitrogen by the sorghum crop and to the amount of sugars in and near the crown of the sorghum plant. These sugars may be so concentrated that soil micro-organisms attempting to decompose them and the old sorghum roots during the period when the following crop is growing compete with that crop for the nitrates present, thus further reducing the supply of nitrates available for the crop following the sorghum.

Sorghums should, therefore, be grown in rotations in which either an inoculated legume is grown following the sorghum crop or in which the land is ploughed as soon as the sorghum is harvested or grazed off and is then left as a moist, bare fallow until the roots are properly decomposed before some other non-leguminous crop is sown. Both procedures should provide ample amounts of nitrogen for following non-leguminous crops if the nitrogen content of the soil was satisfactory prior to the growing of the sorghum crop. Generally speaking, unless the soil is very fertile it is advisable to follow a sorghum crop with a legume, after which any crop, other than cotton, may be grown prior to again growing sorghum.

VEGETABLE PRODUCTION

Vegetable-Growing in North Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

PART 5.

The Cucumber.

THE cucumber is tolerant of a fairly wide range of soils, but best results are achieved on sandy loams of good depth and rich in humus. A constant supply of moisture also is necessary, as good results cannot be obtained unless vigorous growth of the plants is maintained. Ample plant food is required, as much as possible being of an organic nature. Where farmyard manure is not available, green manure crops should be ploughed under before planting cucumbers in a field. Artificial fertilizer should supplement the organic food supply rather than entirely take its place, if best results are to be achieved with crops of the cucumber family.

In coastal frost-free areas of tropical Queensland, the cucumber may be planted throughout the year. Best crops are, however, obtained in the spring, summer, and early autumn. Late autumn and winter-grown crops are often seriously affected by mildew, which restricts growth and cropping of the plants. The season on the highlands is restricted to the spring and summer months.

Planting may be done either in drills spaced about 6 feet apart, or in hills spaced 6 x 6 or 6 x 8 feet. In drill planting, seeds are sown thinly along the row and the plants thinned out to 2 feet to 3 feet apart during the first and second hoeings. When planted in hills, eight or ten seeds are sown in each hill and the plants subsequently thinned by hand to two or three. The comparatively high seeding is to allow for loss in the early stages of growth through the depredations of pumpkin beetles, cutworms, and other insect pests.

Early cultivation of the crop should be fairly deep to maintain the friable condition of the soil, but as the plants grow only the surface should be stirred, as many feeding roots of the plants keep within a few inches of the surface.

The standard variety at present grown in northern areas is Early Fortune. It is found to be very susceptible to mildew, however, and is being gradually superseded by a variety known either as Chinese, Japanese, or Oriental. This variety has been grown for many years by Chinese gardeners of the North. It is vigorous in habit, with large dark

green leaves and long, dark green fruit, and appears highly resistant to mildew. To avoid confusion with the bitter Chinese cucumber, it would perhaps be advisable to recognise this variety under the name of Oriental.

The cucumber is monoecious—that is, it bears male and female flowers separately on the one plant. A profusion of male flowers usually appears first, the female flowers following after the flush of male ones have fallen.

The fruit should be harvested while still young and tender and before the skin commences to turn yellow. As they mature rapidly, harvesting is necessary every second or third day.

The chief insect pests attacking this crop are pumpkin beetles and aphids. Fungous diseases—particularly mildew—also cause considerable damage and loss during certain periods of the year.

Marrow and Squash.

Botanically these two vegetables are members of the pumpkin family. They require similar climatic conditions for their growth and, like pumpkins, are very susceptible to frost. In coastal regions of the North they are normally grown during spring and autumn months, and on the highlands in spring and summer.

Both bush and trailing or vine types are available, but the bushes are the most suitable variety for northern culture, not only because of their easier cultivation and irrigation, but also because their compact habit of growth provides good shade for the roots, stems, and fruit.

The customary method of planting is either in hills or in hilled drills. If care is used in setting out the hills on the square, this method allows for cultivation both ways, thus reducing hand work to a minimum. Seeds should be sown direct to the field, as the seedlings will not transplant successfully. Land for these crops should be well prepared before seeding, as subsequent cultivation must be confined to the surface soil owing to the extensive shallow rooting system of the plants.

Varieties suitable for the North are Long White Fruited Bush Marrow and Early White Bush Squash.

Carrot.

Good carrot soil should be deep and loose. Depth is particularly necessary for the long types, but even the medium-long varieties, such as Chantenay, require more than average depth of soil for the production of roots of first quality.

The carrot is a cool weather crop, but it is quite tolerant of high temperatures. Furthermore, reasonably high temperatures—above 70 deg. F.—are necessary for good germination of the seed, while continuous low temperatures during the period of maturing are detrimental, as they tend to induce roots pale in colour. The autumn-winter-spring climatic conditions obtaining in North Queensland may, therefore, be considered very satisfactory for carrot culture, as the autumn season gives the temperatures necessary for successful germination, while the winter and spring months are cool enough for the production of a good quality carrot without, however, being so cool as to affect the rich colour of the root.

Rich soils are necessary, but heavy manuring of land immediately before planting carrots is not advisable because of the tendency to promote forking of the roots. Artificial fertilizer should be placed fairly deeply in the soil below the position the rows will occupy. If the soil is not already well supplied with potash, the fertilizer used should contain a fair percentage of this ingredient.

Seeding should be done direct to drills in the field and is best done with a seeding machine. Distance to allow between the rows depends on the cultivating equipment available.

Germination and early growth is slow, so that weeds will frequently smother the young plants before the rows can be followed to permit cultivation. The mixing of a few radish or turnip seeds with the carrots at planting will provide early marker plants, as both these seeds germinate very rapidly.

For the early control of weeds in the carrot rows, the application of a selective spray is recommended. A special carrot weedicide is now being manufactured. This spray should be used only at one stage of growth—namely, when the plants have two to four true carrot leaves. The effect of the spray is to kill the weeds and grass without injuring the carrots. Treatment at any later stage of growth than four leaves must not be applied, or the carrots will retain a kerosene flavour when harvested.

The variety of carrot recommended for northern planting is Red Cored Chantenay. This is a medium-long variety, only slightly tapering to a blunt end.

Celery.

Celery is strictly a moderate to cool climate crop, so its culture in North Queensland is practically restricted to the highland areas during the cooler months of the year. Production in coastal areas is not recommended commercially, although its growth in the home garden under special treatment is possible.

A light loamy soil having good water-holding capacity is desirable. Heavy clayey types should be avoided. High fertility is essential, and heavy dressings of organic manure as well as artificial fertilizers are desirable to supply the amount of nutriment required by the crop.

Celery should be raised in seed beds and transplanted to the field. The seed is rather slow in germinating, and may take anything from five to fifteen days to sprout. During this period the surface of the seed bed should be kept continually moist, as drying out is fatal to a satisfactory strike.

In transplanting to the field, it is desirable to set the plants sufficiently close in the rows for the tops to provide continuous shade over the rows. This assists in the blanching of the stalks, which is done by hilling or otherwise excluding the light from the stalks. Hilling tends to promote rots in the stems under warm climatic conditions, so boarding up is preferable in North Queensland. This is done when the plants are about three parts grown by placing boards 8 to 10 or 12 inches wide along both sides of each row and fixed in place with pegs driven into the ground. Boarding up may also be done with strips of paper mulch of the required width supported with bent wire pegs pushed into the soil.

Suitable varieties for growth in the North are Golden Self Blanching and White Plume.

Parsnip.

The parsnip is a long season crop and consequently receives little attention from commercial vegetable growers. It is adapted to a fairly wide range of climatic conditions and will thrive well in highland areas of the North, while good crops also have been produced at times in coastal areas. It requires a soil approaching neutral in reaction, and one that is rich, deep, and friable. A fine seed-bed must be prepared for the planting of this crop, as the young seedlings are weak and tender. Seed is slow in germinating, so the mixing of a few turnip or radish seed with the parsnip seed is recommended for marking of the rows to allow early cultivation. Seed of this crop should be fresh, as it loses its viability rapidly.

No special cultivation or other attention beyond ordinary practices is necessary for the production of the crop. The recommended variety is Hollow Crown.

Lettuce.

Lettuce is probably the most widely grown of salad crops among home gardeners. Recently, its commercial production has gained much popularity in northern areas. It is a crop that can be grown throughout the year in at least some part of the North.

In coastal areas, its commercial production is restricted to autumn, winter, and early spring. In the drier parts of the highland region, it may be grown throughout the year, and in the wet highlands at all times but the wet season.

For the production of high-quality lettuce, warm days, cool nights, and a plentiful water supply are necessary. High temperatures induce rapid seeding, and it is on this account that production in summer on the tropical coast is not practicable. Even on the highlands the summer crop is very loose headed and open and must be harvested early to forestall bolting.

For field production of lettuce, seeding direct to drills in the field and subsequent hand-thinning of the plants is recommended. Seeding is best accomplished with either the single or multiple row seeding machine, according to the area to be cropped. The seeding machine has the advantage over hand-sowing of even seeding rate and regular planting depth, thus ensuring a regular stand. Distance between drills should be regulated by the cultivating equipment available. Two methods of planting are commonly practised—namely, ridge planting and flat planting. In North Queensland ridge planting is only desirable when furrow irrigation is practised, or during the wet season period to assist in drainage. Apart from these exceptions, flat planting should be the general rule.

Where the soil is not naturally rich, a heavy dressing of complete fertilizer mixture is desirable at the time of planting. This should be followed by one or two side dressings with sulphate of ammonia or nitrate of soda during the growing period.

Varieties recommended for the main crop on coastal areas are Imperial 847, Imperial 44, and New York. During the warmer periods of the year—that is, in early autumn, late spring, and early summer—Mignonette is the only variety with which success can be obtained. In highland areas, Iceberg may be grown in the warmer periods, Imperial 847 in the autumn and spring, and New York in the winter. All these varieties are heading types.

Tomato.

Warm weather is necessary to promote vigorous growth of the tomato, but high temperatures inhibit fruit setting. On the other hand, frost will kill the plant.

In North Queensland the crop thrives best in the coastal area between autumn and spring, with the main harvesting period extending from June to October. Those portions of the highlands which are immune from heavy wet-season rains may plant for early autumn harvest, and if they are also free of frost may continue their production almost without interruption up to Christmas. Areas with heavy rainfall which are also subject to frost—such as the Atherton Tableland—can only grow this crop satisfactorily during late spring and early summer under irrigation.

The tomato grows successfully on a wide range of soils and is tolerant of a wide range of conditions. Special varieties have been developed to meet variations in soils and conditions. It is, therefore, necessary for each grower of this crop to discover for himself the variety most suited to his particular conditions. The Bowen district has, over the course of years, evolved for itself a variety—the Bowen Globe—generally suited to the conditions obtaining in that district. In other districts other varieties have given better results. The following list gives a number of varieties that are grown successfully in various parts of the North:—

Earliwinner.—A non-wilt-resistant, early maturing variety with smooth fruit. This variety has good foliage, which makes it suitable for early autumn growth in coastal areas.

Pritchard.—A wilt-resistant variety; globe type fruit, slightly pointed at apex; good foliage; early maturing.

Break o' Day.—Wilt resistant, vigorous sprawling plant; slightly flattened globe type fruit; medium maturing period.

Marglobe.—Wilt resistant, dense bushy growth; globular fruit rather subject to radial cracking at times.

Bowen Globe.—Wilt resistant, very vigorous sprawling plant, with fruit clusters mainly beneath the plant; heavy cropper. Fruit rather pale in colour.

Burwood Prize.—Non-wilt resistant, potato-leaved variety. Fruit slightly flattened globular with a tendency to run small towards the end of the crop. A good summer variety on account of its protective foliage.

Rutgers.—Wilt resistant, medium vigorous, late maturing variety. Fruit smooth flattened globular, in clusters of four to six.

Other varieties that have been grown successfully on a limited scale in various parts of the North are Salad Special, Pearson, Vetemold, and Tatura.

The method of growing may be either on stakes, on vertical trellises, on low trellises, or rambling over the ground. When grown on stakes, each plant should be pruned to a single stem and tied to a stake driven in firmly close to its root. The vertical trellis system requires stout strainer posts at each end of the rows with light supporting posts at intervals between and two wires strained at about 1 foot and 5 feet from the ground. Binder twine is strung up and down from one wire to the other.

The plants are pruned and the stems supported by twisting the binder twine round them. In the low trellis system low posts are driven into the ground to support cross pieces about 18 inches long 2 feet from the ground. A wire is strung along each end of the cross pieces. The unpruned plants grow up between the wires and drape down towards the ground again. This method partially supports the plants, keeping the bulk of the fruit clear of the ground. The fourth system allows the plants to grow unrestrainedly over the ground.

Distance of planting depends on the method of growing to be adopted and on the variety to be grown. Staked plants of the less vigorous varieties may be planted 18 inches apart by 4 feet between the rows. More vigorous varieties should have the rows spaced wider to allow for better circulation of light and air. When grown over the ground, planting may be 4 feet by 6 feet for the dwarf varieties up to 10 feet by 10 feet for the most vigorous kinds.

The length of time from flowering to first harvesting is about six to eight weeks, depending on the variety, and, under favourable conditions, harvesting should continue for one to two months.

Pests and diseases are very prevalent under North Queensland conditions. The corn-ear worm is constantly active and will cause heavy loss unless regular control measures are adopted. Tomato mite may cause serious defoliation of the late spring and summer crops. Fusarium wilt is very prevalent, particularly during the warmer periods of the year when soil temperatures are high. The use of wilt-resistant varieties is the best safeguard against this disease. Various leaf spots are also prevalent and require the use of copper sprays at regular intervals.

Capsicum.

While this plant is actually a biennial, it is normally treated as an annual under commercial cultivation. It is strictly tropical in its requirements, and successfully withstands heat that would be highly detrimental to tomatoes. Temperatures below 75 deg. F. cause slowing down in growth and delay in fruit setting and maturing.

Seed is rather slow in germinating, taking an average of ten days, whilst the seedlings require about two months to attain the transplanting stage. They are raised in the same manner as tomatoes. Distance of planting in the field is usually about 3 feet between the rows and 18 inches between the plants. The period from flowering to first harvesting is five to six weeks.

Both red and yellow fruited varieties are available, and the shape of the fruit varies from apple-shaped to narrow elongated. The apple-shaped types command the best market and also are the easiest to pack. For use as a salad vegetable they should be harvested as soon as they reach full size but before they commence to change colour from green to red or yellow.

The most generally planted variety is Ruby King. It gives good results throughout the northern area. Two other varieties of recent introduction that appear suitable for the North are Sunnybrook and Californian Wonder. All these are of apple-shape or elongated apple-shape.

Egg Plant.

The egg plant requires even higher temperatures than capsicums. It also withstands drier conditions than either the tomato or capsicum. An open, free type of soil is necessary—clay soils are quite unsuitable.

Seedlings are ready to transplant to the field in a month to five weeks from sowing of the seed. The young plants are very sensitive to handling and require careful treatment for successful transplanting. They should be set in the field at about 4 feet between the rows and 2 feet to 30 inches between the plants. Fruiting commences about ten weeks from transplanting, and the period from flower to mature fruit is three to four weeks. The fruit may be harvested at any time after it is about two-thirds grown. If allowed to reach full maturity some varieties grow to a considerable size—nine inches or more in diameter. Such large fruit are not popular on the market, however. Round fruit 4 to 5 inches in diameter are the most suitable commercial size, and the round varieties should be picked to this size. Long varieties are not so popular, but when they are grown should be harvested when not more than 9 inches in length.

New York Purple or New York Spineless is the best variety. It bears a globular fruit of very dark purple colour. Other varieties of paler colour are not regarded so highly. The long types, whether white, yellow or purple, are also less favoured.

HANDBOOK FOR QUEENSLAND FARMERS.



Readers are notified that VOLUME III.—INSECT PESTS AND PLANT DISEASES, and VOLUME IV.—SUGAR CANE AND ITS CULTURE—are now out of print.

Volumes of the **Queensland Agricultural and Pastoral Handbook** Series still available are—

VOLUME I.—FARM CROPS AND PASTURES
(5s., post free);

VOLUME II.—HORTICULTURE (4s., post free).

Both volumes are obtainable from the Under Secretary, Department of Agriculture and Stock, Brisbane.

APPLIED BOTANY

Crofton Weed, a Serious Pest.

C. T. WHITE, Government Botanist.

IT has been observed that Crofton weed* is obtaining a hold in south-eastern Queensland. This plant has established itself as a serious weed pest in parts of the Northern Rivers of New South Wales, and is so aggressive, according to some local farmers, as to oust lantana and other strong-growing plants. It may take possession of the soil to the exclusion of grasses and herbage and, if left untouched, eventually ruin a property.

Description.

Crofton weed (Plate 55) is a plant of shrubby growth, usually 4-6 feet high with numerous upright, branching stems. In sheltered situations, such as along creek banks and in scrub, it may be a weed of more straggling habit. The stems are rough to the touch due to a clothing of bristles. The leaves are 2-3 inches long, 1-2 inches broad, and are broadest near the base. They are borne on a slender stalk $\frac{3}{4}$ -1 inch long. The flowers are white, arranged in terminal sprays 1-3 inches across, and are of ornamental appearance. The seeds are slender, angular, slightly blackish in colour, except at the apex and very base, and are surmounted by several fine white hairs, by means of which they are carried far and wide by the wind.

Distribution and Common Names.

The plant is a native of southern Mexico and Costa Rica. It favours watercourses or rather wet places on hillsides. It has been established as a weed in eastern Australia for some time. It is sometimes called the Shrubby or Upright Mistflower or Giant Hemp Agrimony.

Properties.

It is not known to possess any poisonous or harmful properties at any stage of its growth. It was probably first introduced into Australia as a garden plant, and became naturalised in gullies about Sydney. Several species of Mistflower are cultivated abroad as florists' flowers.

Eradication.

Grubbing out is the most satisfactory means of dealing with it. No experiments have been carried out in Queensland with regard to sprays, but the plant is of a rather soft nature, and should be amenable to treatment by the ordinary arsenical weed-killing sprays. Because of its perennial underground system several sprayings of the older plants

* Botanical name *Eupatorium adenophorum*.

might be required. The big disadvantage of arsenical sprays is that they are dangerous to use on areas to which stock have access, and stock are often fond of arsenically sprayed weeds which normally they would leave untouched. Chlorate weed-killers are at present unobtainable.



Plate 55.
FLOWERING BRANCH OF CROFTON WEED.

Trees for Farms.

THE Forestry Sub-department has adopted a policy of maintaining stocks of young trees in all nurseries, so that plantation operations at present suspended may be resumed as soon as the war ends. Consequently, considerable quantities of planting stock are available from time to time for distribution to farmers and to the public in general.

For planting as ornamentals, as shade trees or for wind breaks, the following prices apply on rail at sending stations:—

	Per dozen.	Per 100.
	<i>s. d.</i>	<i>s. d.</i>
Tubed Plants	5 3	35 0
Open Root Plants	3 6	10 0

Tubed plants are already established in a cylinder of soil enclosed in a metal tube, and the object in planting is not to disturb the soil cylinder. If care is taken, tube planting should give about 100 per cent. survival *at any season of the year*. Spring, however, planting is recommended.

Species supplied in tubes are Hoop Pine, Kauri Pine, Bunya Pine, Cypress Pine (*Callitris* and *Cupressus*) and Eucalyptus.

Open root plants are supplied in securely packed bundles with the roots effectively protected from drying out by sphagnum moss, soil or some such material. The time for planting open root stock is the winter but, ordinarily, planting should be completed before the end of August or, at the latest, early in September. *Pinus* spp. are supplied as open root seedlings.

Concession for Farmers.

If plants are purchased for planting in forest formation under the following conditions concession rates apply:—

1. Trees are to be planted in plots at least 5 rows deep and must be kept free from brush and other growth.
2. Trees to be ordered in lots of not less than 100.
3. The Forestry Sub-department reserves the right to refuse supply where it is considered that planting would not succeed.
4. Concession price is 5s. per 100 on rail at sending station. For tubed stock, a deposit of 10s. per 100 is required to cover costs of tubes. This deposit is refunded when tubes are returned freight prepaid to the nursery.
5. If conditions are not complied with, the full cost of trees at rates quoted for ornamentals will be payable.

Payments should be made in advance and orders should be placed as early in the year as possible.

Selection of Species.

The Forestry Sub-department is prepared to give advice on receipt of information, including:—

- (a) Locality;
- (b) Soil depth, texture and drainage;
- (c) Original vegetation—species and approx. height attained;
- (d) Frosting.

The following notes may enable selection to be made by the purchaser.

Hoop Pine, Bunya Pine, and Kauri Pine:—

These species all require good rain forest "scrub" soils to thrive in forest plots. They are frost tender and low lying areas subject to heavy frosting should be avoided. These species are planted 9 feet by 8 feet, which takes 600 to the acre.

Pinus taeda and Pinus caribaea:—

These species are natives of the Southern States of America and are the type planted extensively around Beerwah and Glasshouse Mountains on relatively poor coastal country. *Pinus taeda* requires better soils than does *P. caribaea*. A soil depth of about 2 feet is necessary for good development.

Pinus patula:—

This is a native of Mexico and is planted in the Pechey and Passchendaele districts. It does better than *P. taeda* and *P. caribaea* under conditions of lower rainfall.

Pinus radiata:—

This is the "Insignis" pine. In Queensland it suffers greatly from "die back" and has proved successful only on fair to good soils in the Granite Belt in the vicinity of Stanthorpe.

Spacing for all *Pinus* spp. is 8 feet by 8 feet, which uses 680 per acre.

Eucalyptus spp.:—

In planting *Eucalyptus*, the evidence of the natural forest may be relied upon. On areas subject to frost the most resistant species are Blue Gum (*E. tereticornis*), Flooded Gum (*E. saligna*), and Grey Ironbark (*E. paniculata*).

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

Cassy.

W.D.G. (Kingaroy)—

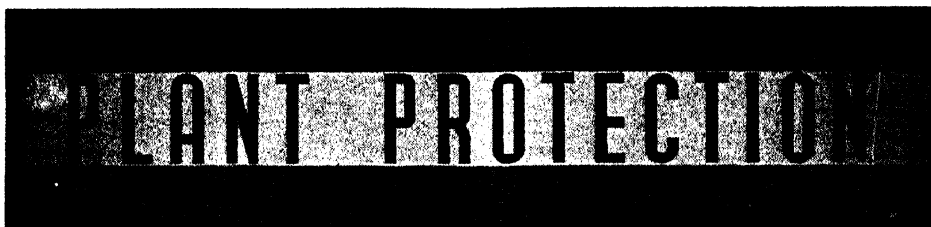
Your specimen is from a native shrub commonly called Cassy. It is botanically known as *Acacia Farnesiana*. This plant is very widely distributed and occurs in Mexico, Asia and Australia. In India it is cultivated for the flowers which yield a perfume. It also produces a gum which is used in India. In western parts of the State it is eaten to a considerable extent by stock and is considered to be a good forage shrub. It is not on the list of plants noxious for the State.

Native Dodder.

W.R.S. (Chinchilla)—

The specimen is the native dodder (*Cuscuta australis*). This plant is very cosmopolitan in its hosts, and has been observed attacking a number of different weeds, garden plants and even shrubs. One year it played havoc with the vitex hedges common about Charleville. This is the hedge that people familiarly know out there as saltbush, although, of course, it is not a member of the saltbush family. There is a strong probability that it would attack lucerne if this were in the vicinity.

The plant is a total parasite, not a saprophyte. It contains no green leaves like mistletoe, which is only a partial parasite. It starts life in the ground, but soon leaves the ground and lives entirely on the host plant.



Little-leaf in the Custard Apple.

A. A. ROSS, Assistant Research Officer.

A DISORDER which has not been recorded previously has appeared in serious proportions amongst custard apple* trees in the Sunnybank district of south-eastern Queensland. The chief symptoms, which very closely resemble those of little-leaf in the apple, are the cessation of growth on one or more of the leaders and the production of small, mottled leaves which may be followed by a gradual die-back of these leaders from the tip to the point of junction with the trunk.

The earliest symptom to appear is the failure of the terminal shoots to recommence growth in spring following the winter dormancy. Instead of normal growth occurring, small lateral shoots develop at each leaf scar on the previous season's wood, and these fail to grow to a length of more than 2 to 3 inches. They carry a small number of abnormal leaves which are characteristically rigid, narrow, folded upwards, much reduced in size, and mottled in appearance. Typically mottled leaves are bronze-yellow in colour between the veins, while the areas immediately surrounding them retain a certain degree of greenness. These leaves remain attached to the shoots for several months, but do not enlarge beyond about 1 inch in length. They usually fall prematurely in late summer or early autumn, after which the terminals begin to die back. Plate 56 shows an affected terminal and a normal leaf and illustrates the great reduction in size, mottling, and the otherwise abnormal appearance of affected leaves. The length of this particular terminal is approximately 8 inches, whereas the length of a normal terminal of the same age would be in the vicinity of 4 to 5 feet.

If an affected terminal is pruned back, healthy growth is not induced, but, instead, severely dwarfed shoots arise from buds just below the pruning cut. Leaves borne by these shoots are similar to those described above, but are usually even smaller. The internodes of such shoots are very short, and this reduction in length, combined with the rigidity of the small leaves, produces a peculiar type of rosette. The pruning cut does not heal over, and a short, dead stump soon becomes sharply defined from the living tissue below. Plate 57 shows the type of growth which follows the pruning-back of a terminal such as that shown in Plate 56.

Following the little-leaf symptoms described above, a die-back begins at the tips of the terminals, and proceeds down the leaders, which carry these terminals, until the trunk of the tree is reached. In dying back, the young growth shrivels and dries, while the bark further down the leaders exudes a small amount of gum and later cracks. Ultimately, the whole of each leader dies, but it is only in very extreme cases that all the

* *Annona Cherimolia*, Mill.



Plate 56.

LITTLE LEAF IN CUSTARD APPLE.—Left: Normal leaf. Right: Affected unpruned terminal.

leaders of a tree are affected. Usually only one or two, frequently on the same side of the tree, develop these symptoms thereby upsetting the tree's symmetrical shape. There is no regularity as regards the position of the affected leaders on the tree, those on the sunny side being affected as frequently and as severely as those on the shady side.

This disorder has been observed mainly in young trees up to the age of approximately seven years, while adjacent, older, bearing trees on the same orchards very often have remained apparently unaffected.

Control Measures.

As a result of experimental work, it has been found that trees affected by this disorder in an acute form can be restored to normal health by treatment with zinc. A series of severely-affected trees were sprayed with a zinc sulphate-lime mixture twice during the summer growing period and complete recovery resulted in all treated trees within four months.

while the disorder continued in all untreated trees. The composition of the spray used was 10 lb. of zinc sulphate, 5 lb. of hydrated lime, and 100 gallons of water. Commencement of growth indicated a response to the use of one spray but, on account of heavy rain falling shortly after its application, it was considered advisable to apply a second spray six months later in order to be certain of securing a positive result.

Other methods of applying zinc to the tree have not been investigated in this instance, but it is reasonable to expect that treatments such as spraying with a concentrated zinc sulphate solution during dormancy, the use of zinc pieces driven into the tree, and the injection of solutions containing zinc salts, which have proved successful in remedying little-leaf in the apple, would be effective in the case of the custard apple also.

As spraying is usually the most practicable method of treating affected trees, and as the zinc sulphate-lime spray at the 10-5-100 strength can be applied at any season without injury to the growing tree, it seems most advisable to adopt this treatment in remedying the disorder whenever it occurs.

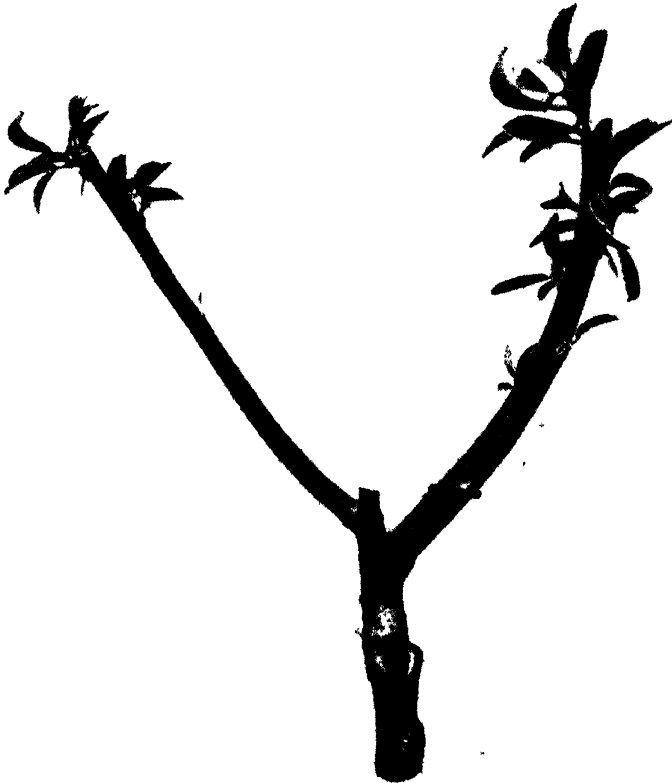


Plate 57.

LITTLE-LEAF IN CUSTARD APPLE.—Type of growth induced by pruning back affected terminal.

Sclerotinia or Cottony Rot.

F. W. BLACKFORD, Assistant Research Officer.

SCLEROTINIA or cottony rot is a disease which is quite common in Queensland, although it only occasionally reaches serious proportions. It has been recorded from a very wide variety of crops overseas, but so far in this State it has been found attacking only lettuce, cabbage, French bean, passion-fruit, and sunflower.

Symptoms.

The symptoms on the various plants affected have many points in common, the most important of which are briefly discussed in the following sentences. The fungus first attacks the stem at ground level, or any part of the plant in contact with the soil, and a soft, dark, water-soaked rot ensues, which gradually progresses upwards. White, cotton-wool like wefts of the fungus* develop on attacked parts of the plant, and numerous, hard, black, irregularly-shaped resting bodies or sclerotia, varying in size from that of a small pea to a bean seed, are found embedded in these wefts (Plate 58). Attacked tissue breaks down in a watery soft rot.

Passing now to other symptoms which are associated with each individual host plant, it should be noted that on lettuce affected by the

* *Sclerotinia sclerotiorum*.

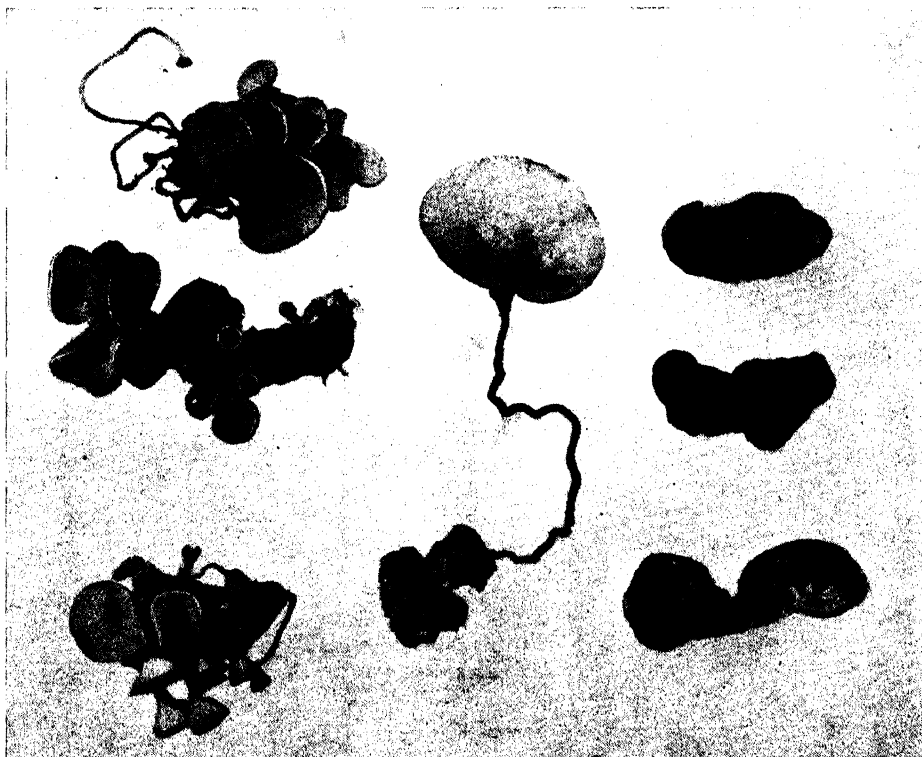


Plate 58.

SCLEROTINIA OR COTTONY ROT.—Left and centre: Mushroom-like fruiting bodies produced by sclerotia. Right: Sclerotia not yet germinated.

disease the lower leaves collapse one by one as the rot progresses up the stem, leaving the heart as a wet mass of decayed leaves (Plate 59). Attacked cabbage bear numerous sclerotia on the rotted surface of the head. In the case of beans the fungus may affect all parts of the plant, the typical wet rot being found on the stem, leaves, and pods alike. The laterals of passion-fruit which touch the ground may be attacked, an infected part at first decaying in the manner typically associated with the disease and finally drying out with the resultant wilting and death of all the rest of the lateral down to the tip. The stems of sunflower are attacked at ground level, the plants wilting and finally dying as the rot progresses and girdles the stem.

Manner of Infection.

The black sclerotia formed by the fungus fall to the ground and become covered with the soil in subsequent cultivation. Given suitable conditions of moisture and temperature they may germinate and produce small, stalked, saucer-shaped, mushroom-like growths (Plate 58), which appear just above the surface of the ground. These bear the spores of the fungus which are forcibly ejected from very minute pores on the upper surface, appearing as a thin cloud of fine dust. The spores are capable of spreading the disease but, as the spore-bearing stage is seldom encountered in Queensland, it is the sclerotia which are more important in this respect. These sclerotia can germinate merely by putting out fungous threads, and these threads are capable of infecting susceptible plants. It is in this manner that sclerotinia or cottony rot infection is generally maintained in Queensland.

Control.

As the sclerotia may remain alive in the soil for long periods, the disease is somewhat difficult to eradicate. Rotation of the land to



Plate 59.

SCLEROTINIA OR COTTONY ROT.—Left: Affected lettuce plant on which outer leaves have collapsed and heart has rotted. Right: Healthy plant.

resistant crops such as tomato, potato, cucumber, or beetroot would help to reduce the number of sclerotia on land on which a crop had been heavily infected. Wet, badly-drained situations favour the development of the fungus so that the choice of a sunny, well-drained site for the cultivation of susceptible crops should help to keep the disease in check. Well-spaced planting to aid air circulation is another precaution which may be adopted in dealing with this disease.

In a small garden, any diseased plants should be carefully uprooted and burned as soon as infection is detected and, on the completion of harvesting, the soil should be treated with a bluestone solution at the rate of 2 gallons per square yard. This treatment should kill any sclerotia which may be left behind when removing the infected plants. The solution, which is prepared by dissolving 1 lb. of bluestone in 7 gallons of water, should be watered on the soil only after all the plants have been removed, as serious injury will occur if it comes in contact with growing plants. A few weeks should elapse before the treated area is replanted. Any metal utensils—other than copper—which are used as containers for the bluestone solution should be well rinsed with clean water after use; if this is not done they will corrode very quickly.

WEED CONTROL IN LUCERNE CROPS.

The intrusion of weeds into lucerne fields is extremely common. Many of these weeds are controllable by mowing and cultivation, but certain grasses and fishweeds are very persistent and difficult to suppress. Grasses usually make their appearance when the lucerne commences to decline after three or four years of high production, or they may invade the field and establish themselves during dry periods when there is very little penetration of rains to the lucerne roots.

One of the most important weeds of lucerne in the Lockyer and on the Darling Downs is woolly-top Rhodes grass. This is a white-headed grass which under mowing flowers close to the ground and sets seed each year. The grass is very evident in infested hay and chaff and lowers the market value of the crop considerably. The best method of controlling this weed is by regular use of the harrows, but complete control is impracticable.

Another fairly common weed in lucerne crops is dodder, which at times causes severe damage to the stand. The dodder seed germinates in the ground, but early in its life the plant severs its connection with the ground and lives entirely on the host plant. This weed can best be eliminated by burning or scorching. Sometimes straw is piled on infested patches of lucerne and fired, but the crop may first be cut and burnt when dry. An effective method of destroying dodder is to scorch the infested patches with a flamethrower, care being taken to treat the stand down to ground level in order to reach all of the stems of the dodder.

When lucerne stands become heavily infested with weeds ordinary control measures are of little use, and ploughing out of the crop, followed by weed-destroying cultural practices, is necessary.



Preparing for Post-War Dairying.

E. B. RICE.

IT must be conceded that dairy farmers are now receiving a more remunerative return for their labours than in pre-war years. While this favourable position continues, every effort should be exerted to ensure that farm efficiency will be raised to a standard which will enable producers to face up to any changed circumstances in the post-war period; in short, the present and immediate future years should be regarded as a buffer period in which to accomplish this objective. In this connection the fundamental factors are (1) quality; and (2) farm efficiency.

Quality.

In the abnormal circumstances of the past few years emphasis necessarily has been more on maintaining production rather than on quality. Although the industry must be credited with having maintained quality under unusual difficulties, this does not justify a complacent attitude. The fact that in pre-war years Australian butter reached the British market not of a uniform quality but as roughly equal quantities of choice and first grades was an initial marketing disadvantage in competing against a uniform quality product from almost every other country. In the eventual renewal of competition with not only the products of other countries but also butter substitutes, quality will undoubtedly assume outstanding importance. The desirable objective of striving to export a uniform quality butter calls for resolute action by every section engaged in an industry, the welfare and stability of which may well depend upon it. Given a cream supply of the requisite quality, the well equipped and technically operated Australian factories are capable of processing it into a high quality butter comparable with the world's best. Therefore, the primary responsibility in the quality drive rests upon the producers. Fortunately, the desired raising of cream quality simply calls for the application in everyday farm practice of the well-known rules of elementary dairy hygiene; it is not a problem the solution of which is intricate or dependent on research. It behoves every individual farmer, therefore, to do his utmost to ensure the achievement of a goal which is well within the range of practicability.

Farm Efficiency.

The urgency for more efficient dairy husbandry is apparent from the relatively low Australian average yearly milk and butterfat production per cow. Efficient production is, after all, economic production. In this connection the chief factors are (a) better feeding; (b) better breeding; (c) herd testing; (d) health of stock.

(a) *Better Feeding*.—So long as reliance is placed almost entirely on the grazing of pastures for the nutrition of dairy cattle, marked progress in dairying will be retarded. The first and all-important consideration in effecting a rapid raising of the productive standard is the availability at all times of adequate quantities of properly balanced foodstuffs. In some other States, as in Queensland, concentrates have always been in short supply at the time when most needed, and normally (except for farmers supplying the liquid milk trade) too costly in relation to the returns received for dairy produce. It is not meant to imply, however, that supplementary feeding should not be encouraged. It is, in fact, the keynote to better feeding, but the supplementary fodder, especially the roughage, should be produced as far as practicable on the farm. Judicious supplementary feeding is the practical means of arresting the usual decline in production when pastures are inadequate to sustain full milk yield. Farmers who regularly conserve excess growth during periods of abundance of pasture, or grow in the reliable rainfall season crops for conservation as hay, silage or grain, realise the benefits derivable from supplementing the pastures in the drier times of the year. With the intensification of dairying, the practice must become widespread. Likewise, there is ample room in many districts for an extension of the acreage sown with green fodder crops for feeding off in periods in which pasture growth is dormant.

(b) *Better Breeding*.—While emphasis is primarily given to the possibilities of feeding in improving the productivity of dairy herds, any progressive policy must also envisage the possibilities of better breeding, herd testing, and health of stock. There is now a general appreciation of the necessity for the use of pure-bred sires for the purpose of grading up ordinary dairy herds, but coupled with better feeding it becomes imperative to use only sires capable of raising the productive capacity of the herd, and thus ensuring the breeding of stock with the inherited capacity for the efficient utilisation of the food consumed. This, in turn, depends upon the systematic testing of the herd for milk and/or butterfat production.

(c) *Herd Testing*.—Herd testing provides the only true measure of the productive value of the dairy cow, and the data available must be constructively used in feeding, culling, the selection of breeding stock, and herd replacements.

(d) *Health of Stock*.—Finally, and this should hardly require mention, constant vigilance must be exercised with a view to improving the health standard of dairy cattle. The spread of disease in a highly improved dairy herd may, apart altogether from decreasing production, cause serious financial loss to the herd owner. An isolation paddock is an essential not seen on nearly enough farms. A first aid outfit, stock of common veterinary medicines, and pamphlets on common ailments should be kept on every dairy farm.



The Breeding Sow.

E. J. SHELTON.

OF the many tasks which fall to the lot of the farmer engaged in the raising of pigs—pedigreed or otherwise—not the least important is that associated with the selection of breeding stock and their maintenance.

Just what type of stock to select, where to buy reliable, healthy animals, the price to pay, how best to transport them, and, in the case of pedigreed stock, the keeping of breeding records, registration, transfer, organisation of stud sales, are all matters demanding close consideration.

The business is simplified once the type is decided on because the points to be observed in selection are the same whether one or more animals are to be selected.

In selecting the breeding sow, the essential points are:—

- Knowledge of ancestry and pedigree,
- Development of, or indication of maternal instinct,
- Indications of milk production,
- Body development, type, constitution, quality.

Invariably it is the strain within the breed to which the greater importance should be attached, for all approved breeds have good points and there are reliable animals within all such breeds.

Modern market requirements necessitate the production of specified types, marketed within a specified range of weights, and in a condition to suit consumer demand, hence the breed of pig—or the cross or grade—has an important bearing on selection. At one time it was thought to be good policy to cross the long, lean Tamworth boar with the short, squat Berkshire sow, but present-day requirements provide no place at all for the short fat breed, whether it be Berkshire, Middle White or either of the American types which were originally developed for quite a different market to the market outlets available to him. In consequence, in bodily conformation breeding stock require to be of similar type even if they are of different breeds. Also, no matter how good the boar may be or how efficient the system of management, unless the breeding sow is capable of producing, suckling, and rearing satisfactory litters, the business of pig production will be a failure, for the breeding sow is the money-maker and the cash return per sow per annum is the ledger item which will make all the difference between profit and loss and which will turn a non-productive business into a profitable one.

Farmers have often been heard to say of their breeding sows, "No, they are not for sale; money would not buy them," thus indicating the paramount value they placed on these animals.

Knowledge of Ancestry.

One of the important points then is to ascertain whether the sow it is proposed to purchase comes from parents of a prolific, easy feeding, profit-making strain. As with the boar, it is not possible to determine these qualities by appearance alone; a reliable guide to inherited qualities is the performance records of the parent stock, and the would-be purchaser should demand of the seller the production of such records whether they be on paper and, or, preferably, to be observed from a close inspection of the stock on the farm.

Many years were spent in educating dairy farmers to the great importance of production records in the dairy herd until to-day the dairy farmer looks or should look for the dam's production record as of prime importance when he goes to select a dairy bull or female foundation stock.

Many pig farmers have not yet developed this technique, but it is becoming more important each year and, in consequence, production records are improving and the business is becoming more profitable.

Pedigree and production records are of the utmost importance and should not be overlooked even if grade or crossbred sows only are to be obtained. It is wise to remember that although individual excellence of an animal itself is highly desirable, it really occupies second place in comparison with the quality and production records of the parent stock.

Pedigree is the permanent record of the breeding of an animal, but is of little value in the absence of reliable records indicating the capacity of the strain to breed true to type and the ability of individual representatives to prove profitable by producing stock of equal or superior merit to those produced by their parents.

With non-pedigreed stock it is essential to study the records which indicate such important features as prolificacy, prepotency, and early maturity. Selection on other lines might result in the purchaser acquiring a really good-looking animal, yet a member of a small and unprofitable litter and perhaps from a slow-growing unproductive strain. The capacity to breed freely, regularly, and abundantly is certainly inherited and is transmitted in no uncertain way. A breeding sow selected from a litter of three pigs cannot be relied on to produce large and satisfactory litters, even though individual animals from such litters may sometimes prove profitable.

Maternal Instinct.

For a sow to be distinctly feminine in type and of a gentle, matronly disposition is obviously important. Usually large bodied sows are better than small bodied animals. The long bodied, light shouldered type is to be preferred to the short dumpy class; coarse masculine types that run to fat and lack maternal instinct are quite useless as breeders. In the course of one's travels one often notices big, burly, "beefy" sows that look as if they would turn up the nose at the job of suckling litters; some, again, are of a cranky, fighting disposition, preferring all the room at the food trough or in the sleeping quarters. These types are a bugbear to the industry, as also are the small, pot-bellied types sometimes seen with litters of three and four, this especially so where the farmer argues the sow is old enough to breed just as soon as she is big enough to take service.

Indications of Milk Production.

The ability of the sow to produce large quantities of rich nourishing milk is inherited just as it is in the case of dairy cows. Many breeders overlook this most important point and select their stock without any reference at all to the milk production capacity. It is a fact that some strains of pigs and some animals within other strains are very poor milkers and lack maternal instinct; they do not produce sufficient milk to satisfactorily nourish their litters. Other strains are noted for ability to milk heavily for a period of two months or more for each litter.



Plate 60.

Length of body is a characteristic much to be desired in brood sow selection. Possibly this sow is a little heavy in the shoulder for a young animal, but within her breed is a good type.

According to overseas authorities, the average daily milk yield for Berkshire, Poland China, and some other brood sows whose breeding was not recorded ranged from 4.9 to 6.3 lb. daily. The average total yield for 84 days, by which time they went dry, was 429 to 532 lb. Some sows gave twice as much milk as others. Much difficulty was experienced in obtaining the sow's milk for purposes of testing or recording, hence these figures must be accepted as a guide only to the productive powers of good quality breeding sows.

In special tests it was shown that sows' milk is richer than cows' milk in all nutrients and especially in fat, for it contains on the average 6.7 per cent. fat. One investigator found the fat globules of cows' milk only one-fourth as large as those of sows' milk, but eight times as numerous.

The commercial value of a litter of pigs at weaning time will be influenced very largely by quantity and quality of the milk produced by the sow, hence the number of teats and development of the sow's udders is of much importance. The number of teats varies from ten or fewer to fourteen or even sixteen. Since each pigling requires its own teat, and will strenuously fight for it, it is essential the sow have from twelve to fourteen teats in order to be able to suckle a corresponding number of pigs. The number of teats should not be fewer than twelve. It is undesirable to retain ten teated sows (or sows with fewer teats) and generally more than fourteen teats is unnecessary, although very long

bodied sows capable of rearing very large litters may have sixteen well-developed teats. The teats should be prominent, evenly spaced and be set well towards the front of the belly. It is suggested those teats nearest to the breast are those which produce the largest flow of milk.

Prolificacy.

Prolificacy should be the constant aim in selection and development of breeding stock. If the average litter can be maintained at 8-10 (or 12) reared, there will be a greater measure of success than if the number reared is fewer than eight. The following summary of litters notified



Plate 61.

Typical Large White sow and litter. It is because of the prolificacy and suitability for bacon production of this breed of pig that it has attained world-wide recognition within the pig industry. Note.—Sow is in good breeding condition, although suckling a large litter. This is the type of brood sow to which the industry must look in the future.

to the National Pig Breeders' Association of England for the year ended 31st December, 1939, and published in the 1940 volume of the National Pig Breeders' Association Herd Books, demonstrate the importance of this characteristic:—

Breed.	No. of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.	No. of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.	No. of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.	
									1937.	1936.
Berkshire ..	198	8.88	6.95	242	7.9	6.62	220	7.85	6.37	6.19
Large White	13,513	10.62	8.15	13,620	10.67	8.17	13,324	10.62	8.07	8.06
Middle White	451	9.57	7.37	660	9.72	7.59	679	9.45	7.46	7.6
Tamworth ..	96	7.41	6.34	118	7.95	6.78	94	8.37	6.61	6.45
Weasex Saddleback	1,975	9.83	8.22	1,768	9.86	8.33	1,713	9.91	8.25	8.33

In studying these figures, it is well to remember that the very large number of litters recorded in favour of the Large White might favourably influence the figures in that breed, as against, say, the Tamworth, with fewer litters notified. The figures, however, can be accepted as a reasonably reliable guide of production and rearing averages for sows in these breeds of pigs.

Record Litters.

Although record sized litters are often reported and emphasise again the prolific nature of the breeding sow, extremes are undesirable. There are records of litters varying in numbers from fourteen to twenty-three, but very rarely is it possible for the sow to suckle and rear so many.

The impulse to breed occurs at all seasons of the year and is not a seasonal condition as in the case with animals who bear fewer progeny and come in more occasionally. This period usually develops within ten days of farrowing and recurs every twenty-one days, persisting on each occasion for a period of three days.

The normal breeding life of the sow is five to six years or more; exceptionally good sows have been known to continue breeding up to the age of ten years, but, in general, the sow becomes less profitable each year after reaching six years of age. Thus, commencing at nine to twelve months of age and breeding regularly twice a year the sow should produce up to twelve or fourteen litters in the course of her profitable life after which it is preferable to prepare her for the butcher.

Period of Gestation.

The average period of gestation in the breeding sow is stated by various authorities as four months; or three months three weeks, three days; 112 or 114 days; or 116 to 120 days; or sixteen weeks. The shortest known period is 110 days, and the longest known period is 130 days. No details are available as to the individual records in these cases. (See Gestation Chart, page 171.)

It is apparent from Australian experience that sows having the benefit of succulent and nutritious pasture and plenty of daily exercise in the sunshine in clean pig paddocks where they are undisturbed by other stock, are more likely to farrow satisfactory litters than sows that are continuously housed or held under conditions other than those referred to. But keeping pigs in pig paddocks is only satisfactory where clean, warm, dry shelter sheds are available in which the pigs may camp at night. As the farrowing stage approaches, it also is preferable that each sow be drafted to her own individual yard or pen; this should be done approximately three weeks before the birth of the pigs.

Sows do not always agree when housed together at farrowing time and any disturbance at feeding or at any other time is likely to result in abnormality at birth of the pigs, if not in abortion or other calamity.

Under open air conditions and with succulent grazing there should be little or no necessity for purgative medicines before or after farrowing, but as individuals differ in habits and some sows become very lethargic at this stage, a warm bran mash in which is incorporated three fluid ounces of castor oil and just sufficient table salt to disguise the flavour of the oil will prove beneficial if given two or three days before the birth-date. The use of drastic purgatives should be strictly avoided, as the after effects are liable to bring on irregularities in the digestive organs. In these as in many other matters associated with the management of pigs, it will be found that careful control is a very great advantage and will do more than medicine or force in the obtaining of satisfactory results. The food should be of a laxative nourishing

GESTATION CHART FOR BREEDING SOWS.

The normal period is 114 days; this may roughly be remembered as three months three weeks and three days, or sixteen weeks. Variations of one, two, or three days from this time may occur.

January	February	March	April	May	June	July	August	September	October	November	December	Date of Farrowing.
1	24 April	1	23 July	1	22 Aug.	1	22 Oct.	1	23 Dec.	1	22 Jan.	22 Feb.
2	25 April	2	24 July	2	23 Aug.	2	23 Oct.	2	24 Dec.	2	23 Jan.	23 Feb.
3	26 April	3	25 July	3	24 Aug.	3	24 Oct.	3	25 Dec.	3	24 Jan.	24 Feb.
4	27 April	4	26 July	4	25 Aug.	4	25 Oct.	4	26 Dec.	4	25 Jan.	25 Feb.
5	28 April	5	27 July	5	26 Aug.	5	26 Oct.	5	27 Dec.	5	26 Jan.	26 Feb.
6	29 April	6	28 July	6	27 Aug.	6	27 Oct.	6	28 Dec.	6	27 Jan.	27 Feb.
7	30 April	7	29 July	7	28 Aug.	7	28 Oct.	7	29 Dec.	7	28 Jan.	28 Feb.
8	1 May	8	30 July	8	29 Aug.	8	29 Oct.	8	30 Dec.	8	29 Jan.	1 Mar.
9	2 May	9	31 July	9	30 Aug.	9	30 Oct.	9	31 Dec.	9	30 Jan.	2 Mar.
10	3 May	10	1 Aug.	10	31 Aug.	10	31 Oct.	10	1 Jan.	10	31 Jan.	3 Mar.
11	4 May	11	2 Aug.	11	1 Sept.	11	1 Nov.	11	2 Jan.	11	1 Feb.	4 Mar.
12	5 May	12	3 Aug.	12	2 Sept.	12	2 Nov.	12	3 Jan.	12	2 Feb.	5 Mar.
13	6 May	13	4 Aug.	13	3 Sept.	13	3 Nov.	13	4 Jan.	13	3 Feb.	6 Mar.
14	7 May	14	5 Aug.	14	4 Sept.	14	4 Nov.	14	5 Jan.	14	4 Feb.	7 Mar.
15	8 May	15	6 Aug.	15	5 Sept.	15	5 Nov.	15	6 Jan.	15	5 Feb.	8 Mar.
16	9 May	16	7 Aug.	16	6 Sept.	16	6 Nov.	16	7 Jan.	16	6 Feb.	9 Mar.
17	10 May	17	8 Aug.	17	7 Sept.	17	7 Nov.	17	8 Jan.	17	7 Feb.	10 Mar.
18	11 May	18	9 Aug.	18	8 Sept.	18	8 Nov.	18	9 Jan.	18	8 Feb.	11 Mar.
19	12 May	19	10 Aug.	19	9 Sept.	19	9 Nov.	19	10 Jan.	19	9 Feb.	12 Mar.
20	13 May	20	11 Aug.	20	10 Sept.	20	10 Nov.	20	11 Jan.	20	10 Feb.	13 Mar.
21	14 May	21	12 Aug.	21	11 Sept.	21	11 Nov.	21	12 Jan.	21	11 Feb.	14 Mar.
22	15 May	22	13 Aug.	22	12 Sept.	22	12 Nov.	22	13 Jan.	22	12 Feb.	15 Mar.
23	16 May	23	14 Aug.	23	13 Sept.	23	13 Nov.	23	14 Jan.	23	13 Feb.	16 Mar.
24	17 May	24	15 Aug.	24	14 Sept.	24	14 Nov.	24	15 Jan.	24	14 Feb.	17 Mar.
25	18 May	25	16 Aug.	25	15 Sept.	25	15 Nov.	25	16 Jan.	25	15 Feb.	18 Mar.
26	19 May	26	17 Aug.	26	16 Sept.	26	16 Nov.	26	17 Jan.	26	16 Feb.	19 Mar.
27	20 May	27	18 Aug.	27	17 Sept.	27	17 Nov.	27	18 Jan.	27	17 Feb.	20 Mar.
28	21 May	28	19 Aug.	28	18 Sept.	28	18 Nov.	28	19 Jan.	28	18 Feb.	21 Mar.
29	22 May	29	20 Aug.	29	19 Sept.	29	19 Nov.	29	20 Jan.	29	19 Feb.	22 Mar.
30	23 May	30	21 Aug.	30	20 Sept.	30	20 Nov.	30	21 Jan.	30	20 Feb.	23 Mar.
31	24 May	31	22 Aug.	31	21 Sept.	31	21 Nov.	..	..	..	21 Feb.	..

nature, and quantity should be strictly regulated according to the condition of the sow and litter.

It is unwise to rout in-pig sows with dogs or to force them to jump logs or troughs or to crowd together and rush through narrow openings or under low-set rails. Exposure to extremes of the weather, undue excitement caused by the presence of other sows or the attentions of an over active boar, the use of rough coarse fibrous foods, lack of minerals and succulent green food, lack of drinking water, all have disastrous effects on the progress both of sow and of her litter.

The breeding sow should be normally and regularly exercised. She should be of a docile contented temperament. Any tendency to flightiness is a bad quality, for a vicious sow is not only a danger to her own pigs, but also to children and even those attending to her. Similarly, any tendency to sluggishness or overfatness should be guarded against. Where animals are active and well cared for, they willingly take regular exercise and look and anxiously wait for it. They will maintain themselves in better breeding condition and will not have the tendency to become lethargic and sickly, or to become costive; in fact, constipation is one of the sow's worst ailments at the stage when she is due to farrow and unless promptly corrected is liable to lead to fevers (usually referred to as milk fever) and cessation of milk supply.

Weaning.

Weaning invariably takes place at about 8 weeks of age. In cases where the sow can comfortably suckle her pigs for more than 8 weeks, it will be found to be an advantage to allow sow and suckers to run together for a longer period up to 9 or 10 weeks, even if in the meantime the sow comes in season and is mated.

Size, Conformation and Control.

Bodily conformation is certainly hereditary, that is why certain families within a breed become so popular. Breeding sows should be large, roomy, yet well-proportioned, with wide deep chest, long deep body and well developed hindquarters, otherwise they are unable to allow for the development of large thrifty litters and for their free and easy birth at farrowing time.

This capacity to produce and rear numerous progeny should be encouraged by proper development during the early stages of the animal's life, and by its selection from strains noted for those desirable and necessary qualities. This requires that during the growing stages the animal should be encouraged to grow and stretch out in preference to being fattened, and this can best be done by permitting free range over succulent pastures where the animal will have opportunity of picking up not only green food and mineral elements but will have the benefit of sunshine, exercise and a clean, healthy living environment. Animals appreciate such conditions, and grow and develop to considerably more advantage than is possible under conditions unfavourable to such rapid growth.

Constitution.

The innate bodily strength of an animal and the ability to withstand adverse conditions, together with the capacity to resist disease, is referred to as constitution and as such represents an extremely important point in brood sow selection.

THE BREEDING SOW.
A Striking Contrast in Conformation.



Plate 62.
LARGE WHITE.

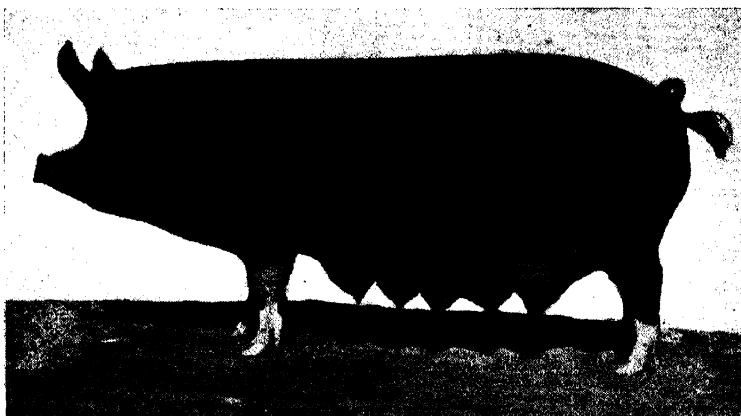
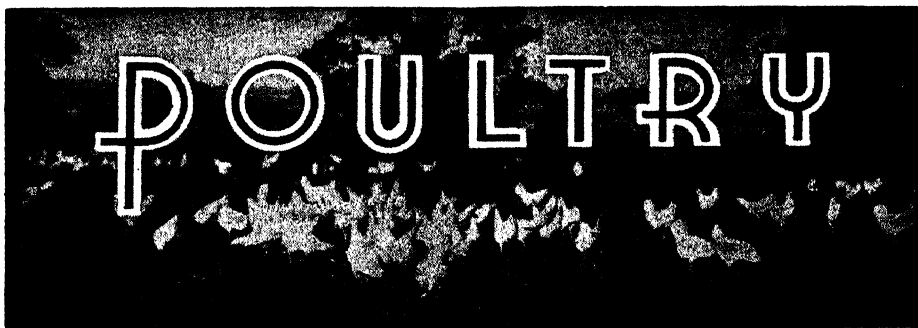


Plate 63.
BERKSHIRE, CANADIAN TYPE.

Formerly the Berkshire breed was quite unlike the Large White in type and conformation. The more recently introduced type of Berkshire referred to as of Canadian origin strikingly illustrates the change that has taken place. Both sows were Champions at the same Royal National Show and both show a wonderful capacity for milk production.

The vigour and health of an animal is dependent on its constitution, although it is possible to ruin a good constitution by mismanagement and neglect. In the brood sow a strong vigorous constitution is indicated by a full, broad, deep capacious chest (withal a light shoulder is highly desirable), roomy heart girth, good width between the eyes, ears and forelegs, clean bright eyes, a moist snout, soft, silky, mellow skin and hair, and an attractive healthy action. Pigs need to be strong and healthy if they are to prove profitable, and it is important that all the features mentioned should be given due appreciation when selecting the breeding sow.



Marketing Eggs.

L. R. JESSER, Poultry Inspector.

EFFICIENCY in egg production is of little use unless the same degree of effectiveness is extended to marketing. The quantity of eggs marketed at less than top values, because of lack of quality, indicates definitely that all the necessary care has not been extended to the marketing of the commodity. The loss sustained by the individual in the marketing of second-quality eggs is from 12 to 15 per cent.

Protecting Egg Quality.

As the loss caused by deterioration in quality can be so great, it will be readily understood that everything should be done to prevent this deterioration. The producer should not lose sight of the fact that the hen provides a highly nutritious food in a convenient form, wrapped and sealed within a shell, although of a highly perishable nature.

The poultry-raiser has three principal factors to consider in the protection of egg quality—

Fertile eggs.

Soiled eggs.

Effect of heat on the egg.

Other influences which affect quality and to which eggs may be exposed are moulds and bacteria. These influences, however, are not common where the best possible conditions for production have been established.

The production of fertile eggs should be avoided as far as possible. Although incubators are operated at a temperature of 100 deg. Fahr., it does not need a similar temperature to commence the development of the germ, and in the height of summer it is almost impossible on many farms to keep eggs at a sufficiently low temperature to prevent some form of cell division developing in fertile eggs; and once embryonic development has advanced to any degree and stops, decomposition soon follows. In these circumstances, roosters should not be allowed to run with the flock, excepting during the period when breeding is necessary.

The next condition to guard against is the soiling of eggs in the nests. Naturally, an ample number of clean nests, sufficiently roomy, should be provided. In these nests it is essential to have some form of material to make the nest comfortable and attractive to the bird, to

protect the egg from being broken, and to protect the egg, as far as possible, from becoming soiled. Many egg producers use old butter boxes for nests. These, in size, are very suitable, and in planning any form of nests, the butter box could be used as a guide for size. The main factor is to make nests so that they are easily kept clean, and of material which is free from odours, as eggs, like milk, readily absorb taints.

Various forms of nesting material may be used, such as straw, shavings, sawdust, sand, and shell-grit. Shavings and sawdust because of their fineness are more absorbent and are not scratched out of the nest to the same extent as straw; they also have a greater cleansing effect on the feet of the birds, thereby preventing, to some extent, the soiling of the eggs. If sawdust or shavings are used, pinewood residue should be chosen, as many of our hardwood sawdusts have a staining effect on the shell of the egg. Shell-grit is a reasonably good nesting material, naturally not so absorbent as sawdust, but usually too expensive in many districts for extensive use. Sand is much like shell-grit, but many particles become attached to the moist gelatinous coating of the egg when it is laid, and they are most difficult to remove without washing.

To provide suitable nests and nesting material, however, is not enough. The frequency with which eggs are gathered has a very marked effect on their cleanliness, and, more than that, upon the labour entailed in preparing the eggs for market. Three gatherings a day is a sound practice, particularly when production is at its height and several birds are visiting each nest daily. When production is slack, the gathering of eggs may be reduced to twice daily. Not only does the frequency with which eggs are gathered assist in keeping the eggs clean; it also protects them against breakages, and the possible development of the vice of egg-eating.

Effect of Heat.

The egg, when manufactured, is full. On cooling, separation occurs between the two membranes within the shell of the egg, and a small air cell is formed. Heat hastens the evaporation of the moisture contained in the egg, enlarging that air cell.

The albumen also becomes thinner, and the yolk more visible on candling, and instead of being retained in a more or less central position of the egg, becomes "sided," and at times attached to the shell. When this type of egg is broken for poaching or frying, the yolk is flatter, not standing up like a new-laid egg, or an egg which has not been subjected to heat, and the albumen being thin, spreads—conditions which the consumer does not appreciate. It does not require a very high temperature to cause this breaking down, and it has been found that a temperature over 60 deg. Fahr. is conducive to rapid deterioration of quality. In fact, temperatures of 68 deg. Fahr. have been known to stimulate embryonic development; therefore the coolest position on the farm should be sought for the storage of eggs pending transport to market. Further protection of the egg against excessive heat is given by frequent gatherings, as it prevents their being re-heated by the visits of other birds to the nests.

Eggs should be gathered in 2-gallon buckets with rigid sides. A bucket of this capacity will hold from 100 to 120 eggs, the bulk of which is conducive to the rapid loss of animal heat when placed in a cool place.

Nests should be placed in positions which are not exposed to the sun. For this reason, nests extending in front of the poultry sheds are not recommended as most suitable for the preservation of quality. During transit to market, cases of eggs should also receive some protection.

The storage of eggs on the farm pending transport to market is most important. Eggs should be held in a room which is as uniform in temperature as practicable—one between 40 deg. and 60 deg. Fahr. would be just right. The room should be free from odours and have good ventilation. If the air is dry, humidity may be increased by setting pans of water about the room, or sprinkling the floor. Excessive moisture, indicated by condensation, should, however, be avoided. If such a room is not available, the egg-cooling and humidifying cabinet illustrated (see Plate 64) will serve a useful purpose in providing cooling and humidifying facilities.

Packing.

The practice of using chaff and similar material for packing has, happily, largely ceased, and the use of standard case and fillers adopted. Many producers, however, with the object of giving greater protection to the egg, use chaff and material of a like nature in the bottom and frequently the top of the cases. This is not recommended. As well as causing the eggs to become dusty in appearance, the practice exposes the eggs to infection by moulds. If it is at all necessary to use anything to take up the slack in the case, crumpled paper is preferable.

The standard 30-dozen case, as now used by the Queensland Egg Board, obviates the necessity for any further protection, and is recommended to all producers as the best to use.

Adherence to the following rules will largely govern the production of quality eggs:—

1. Breed only from birds that produce eggs of satisfactory size and shape and good-quality shell.
2. Provide only wholesome food, including shell grit, and fresh water. Remember that yolk colour is improved by the feeding of green feed and yellow maize.
3. Produce infertile eggs for market. Fertile eggs may quickly decay because of partial embryonic development.
4. Provide at least one nest and nesting material for each five layers. Keep the nests dry and protected from the sun.
5. Do not allow broody hens to occupy nests. They heat up the eggs.
6. Gather eggs thrice daily in summer, and twice in winter, in a clean bucket, and stand in a cool place until animal heat is lost before packing.
7. Do not wash eggs unless absolutely necessary to make them completely clean. Aim at keeping them clean by good management.
8. Keep eggs until marketed in a cool, clean room, free from odours.
9. Market eggs at least twice weekly, protecting them from the sun during transit.
10. Use only standard cases and fillers for packing.

An Egg Cabinet.

Following are particulars of a satisfactory egg cabinet for use where a cool storage room is not available:—

Capacity.—Bottom shelf: Quantity of egg buckets or wire baskets. Middle shelf: Three 30-dozen cases of eggs. Top shelf: Three 30-dozen cases of eggs or three 30-dozen empties for cooling.

A HOME-MADE EGG COOLING CABINET.

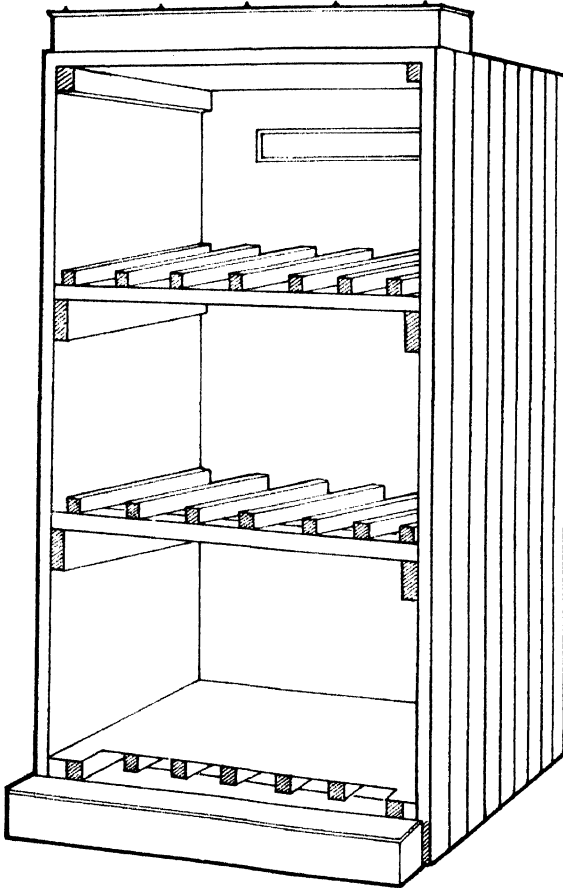


Plate 64.

A Frontal View with Bag Curtain Removed, showing Open-slatted Top and Middle Shelves, with Ventilation Hole in Top of Back Wall, and Cut Out in Fibrolite, Slide-in, Bottom Shelf Cover.

Curtain.—Two thicknesses of jute sacking quilted together, 45 inches wide and 80 inches in length. This carries water from the top to the bottom water pan. It covers the whole cabinet front and serves as a wick and as an evaporation surface. This curtain should be frequently washed.

Water Pans.—Two heavily galvanised pans 4 inches deep, 6 inches wide, and 45 inches long. One rests on the top front of the cabinet and is kept filled with cool, clean water. It has five or six slender pegs on

its upper front edge to prevent the water-soaked curtain from slipping, and two small lugs at back to screw on to top of cabinet. The other pan rests on floor and receives the drip from the curtain.

Dimensions.—To accommodate three 30-dozen cases on each shelf the over-all measurements are—

Height, 70 inches.

Width, 45 inches.

Depth, 29 inches.

Materials Required.—

Back wall, side wall, and top, 4 by 1 V.J. pine.

Bearers for shelves, 2½ by 1½ D. pine.

Ledges under bearers, 3 by 1 D. pine.

Shelf joists, 1½ by 1½ D. pine.

Fibrolite or other insulating material for lining of sides and back, and loose slide-in floor.

THE FEEDING OF FOWLS.

Poultry-raisers as a whole have a very fair idea of the principles and practice of feeding, and take into consideration factors which make for efficient and economic production.

The present-day values of cereals may induce some to depart from old and accepted practices in order to reduce costs. There are three points, however, that must not be lost sight of, if the best results are to be obtained and the general health of the stock maintained—viz., the vitamin content of the ration, the protein content, and the quantity supplied.

Vitamins.—Vitamin A is of outstanding importance at the present juncture, for a shortage in the ration may cause outbreaks of nutritional roup as well as lowered egg production. The feeding of yellow maize and green feed ensures a sufficient supply of this vitamin. The price of maize will, however, preclude its inclusion in the ration to the same extent as in past years. Wheat will be used to replace this cereal, and so one source of vitamin A is lost.

On most poultry farms during the winter months green feed is not plentiful; consequently under normal circumstances the loss due to a shortage of maize cannot be overcome. It is therefore of paramount importance that the poultry-raiser should make a special effort to supply the birds with good succulent green feed. Green feed is the cheapest form in which the birds' requirement of this vitamin can be supplied. In cases where home-grown feed cannot be obtained, poultry-raisers should use at least 10 per cent. of good green lucerne chaff or meal in the mash fed to their birds.

Protein.—To obtain the maximum economic production, laying birds should have in their ration (i.e., grain and mash) a total of approximately 15 per cent. of crude protein. Maize has about 10 per cent. and wheat about 13 per cent. of protein. Where maize has been used extensively and is replaced with wheat it may be desirable to reduce slightly the protein content of the ration. This is most easily brought about by a slight reduction in the meat meal fed.

Generally speaking, however, the protein-rich meat meal is not overfed, and its greater use is advisable in certain circumstances. This is particularly so in the case of the poultry-raiser who feeds extensive quantities of skim milk to his birds. With the approach of winter the milk supply will probably diminish. In such cases the loss of protein of animal origin in the form of milk should be supplemented with meat meal.

Quantity.—Providing the right kind of food is being used, economic production is only possible by feeding the birds all they will consume. Do not be afraid of making your birds unduly fat. The good producer will convert the food supplied in excess of body requirements into eggs. Birds which cannot do this should be culled and sold for table purposes.

FARM ECONOMICS

Farming Efficiency.

C. H. DEFRIES.

EFFICIENCY may be thought of in terms of yield per acre, output per unit of labour, income per unit of labour or return per unit of capital according to the particular problem in mind, but the central point to emphasise in respect of the individual farm is that maximum economic production can only be achieved if every practicable means is used to avoid waste and misdirected effort not only of materials and power, but also of human labour. The present object is to direct attention to some aspects of the economic use of farm resources, and in particular to the application of what is called the law of diminishing extra returns. By thinking along the lines suggested the essential nature of the problem of attaining maximum output consistent with economic production may, it is hoped, become clearer and so assist farmers to achieve this aim.

The Economic Problem.

It is as well to realise at the outset that whenever an effort is made to attain definite ends with scarce means, whether in farming or any other human activity, there is a sense in which it can be said that an economic problem is involved. The goal at which the farmer aims can be broadly described as economic production. As everyone knows, the means—labour, power, equipment, and materials used on the farm—are scarce enough. The term scarce does not, however, refer merely to physical shortage as such but rather to the fact that the means have alternative uses to which they can be put, and that there is insufficient of them to supply fully all the various demands that are made of them.

For instance, the tractor used on the farm could also be used for making roads; some of the materials used in making the tractor could have been used in making an army tank or a truck. Similarly, the tractor can be used to plough land for a crop of wheat or oats, potatoes or corn, fodder crop or grain crop, and so on; examples could be multiplied without end. From these alternatives there arises the economic problem of some choice as to the allocation of the means of production among various ways of using them.

Therefore, whenever a farmer uses labour or machinery for one purpose rather than another, there is implied some prior decision made that this should be done. The whole basis of farm planning rests on an examination of the reasons for arriving at such decisions. Obviously, the decision may have resulted simply as a result of the farmer being in the habit of doing one thing rather than another, this may or may not be desirable; it would depend on whether or no the habit is based on experience and sound judgments made some time in the past. The decision may result from following rule of thumb methods not so

soundly based; or there may have been some prior deliberation and thought. Under prevailing conditions, there are obvious grounds for believing the most desirable attitude to be the lastmentioned, but before considering some of the basic elements of this type of problem, it might be as well to examine some of the peculiarities of farming which modify the cut and dried sort of efficiency planning attained in, say, a manufacturing establishment.

The Nature of Farming.

The first striking feature about farming as an industry is the lack of control possessed by the individual over the forces that are used by him in the process of production. Unlike the manufacturer, the farmer is unable to say with absolute precision what tasks he or his employees will be engaged on the following day or the following week. His future actions are largely influenced by the weather or other unpredictable natural forces which can upset any carefully laid plans. His intention to plough to-morrow may easily be changed by rain; there is no knowing in advance the exact number of times it will be necessary to cultivate land in preparation for the coming crop. The tractor might have to be used for ploughing at the same time as it is needed for scarifying on inter-row cultivation and horses have to be used instead. It is clear then that planning on the farm has to be flexible in order to meet the requirements of varying natural conditions.

Secondly, notice has to be taken of the interdependence of the different sections of the farm. The pattern of organisation existing at any time is influenced by a number of different factors, such as the climate, soil, topography, market and economic conditions, the preference of the farmer, and so on; the working out of the most suitable farming system under any given conditions is a complex study in itself, but to the practical farmer it is obvious that his crop and his stock enterprises are very closely linked together. A vivid example of this is the control of weeds by sheep on a wheat farm. Again, the way one crop prepares for another may be noted—as on the Burdekin Delta where the winter potato crop leaves the soil in excellent condition for late-planted sugar-cane. It might be decided that the best way of utilising farm labour is to ensure that the demand of the various farm enterprises for labour is uniform throughout the year. That is, to make sure that the requirements of all the various crops and stock kept on the farm are complementary one to the other, instead of all competing for labour at the same time. In an area such as, for example, North Queensland, where seasonal conditions throughout the summer months preclude much activity on the land and where most production is concentrated into winter months, this has obvious limitations.

This is a most interesting and helpful aspect of farm economics, but at this stage it is sufficient to say that the second feature of farm planning worth emphasising is the necessity for full awareness of the limited alternatives that are available to the farmer. The whole system of farming cannot be adjusted except for the most drastic reasons and every change made has to be analysed to find out how other portions of the farm will be affected.

Considerations such as these are frequently sufficient to discourage any attempts to improve efficiency. A more balanced outlook would recognize that while farming is to a large extent an "art," the modifications imposed by the conditions under which farming is carried on do not eliminate the necessity for taking into consideration either

the scientific aspects of farming technique, or the economic aspects of the farm business. Only if all three aspects of the farm are given their due place in a balanced attitude can something be done to supplant rule of thumb methods which may hinder efficient production.

The Law of Diminishing Extra Returns.

One of the most important ideas it is desirable to grasp in respect of farm efficiency, and the allocation of the factors of production among the various available alternatives, is that of the law of diminishing extra returns. The essence of this law is that in the production of foodstuffs there is a point in the application of capital beyond which the extra returns gained from the application of each additional unit of capital tend to decline. It is a very important tendency in agricultural economics and has widespread application, but it will be sufficient here to refer to it only insofar as it affects the farmers' immediate production problems.

Use of Fertilizer—An Example.

The tendency to diminishing extra returns is most effectively illustrated by thinking of the application of fertilizer to a crop. If the tendency did not exist, it would be possible by applying more and more fertilizer to a given piece of land to keep on increasing the yield of crops as the population increases without having recourse to new land. In terms of the history of the last 100 years, this would have meant that the lands of the new world would not have been required to feed the population of Europe during the stage of its industrial expansion. On the contrary, the course of events is that as the population expanded in Europe more and more of the lands of the new world were required for food production.

When fertilizer is applied to a crop the extra returns from each succeeding application might at first increase—this is the stage of increasing extra returns—but very soon these extra increments of yield begin to grow smaller even though the yield itself increases; the extra increase, in other words, is less than proportional to the additional quantities of fertilizer added.

This is the stage of diminishing extra return. It means that every extra hundredweight of fertilizer given to a crop gives an increase in yield up to a point, but each increase is less than the one immediately preceding it. If we think of more and more fertilizer being applied, it is easy to see that ultimately we shall get to a point when the yield itself will begin to decline. Therefore, it does not pay to add unlimited fertilizer to crops; and one of the objects of fertilizer trials is to determine what are the limits of economical application. That is one important reason why all farmers should take a keen interest in this type of work.

Two Main Farming Problems.

The two main types of problems in the solution of which an appreciation of the law of diminishing extra returns might be of some help to a farmer are—

- (1) To determine how intensely a certain area of land should be cultivated.
- (2) To determine the area over which the farm resources should be spread.

In actual fact, these are two ways of looking at the same problem, but it is with this duality that they strike the farmer. The first when

he is thinking in terms of how much fertilizer is to be applied per acre for optimum results or how much seed potatoes is to be planted per acre, or how many times corn is to be cultivated, and so on. The assumption is that it is possible to buy the amount of fertilizer decided upon and to engage the labour and the power required for cultivation. On most farms to-day, however, the farmer has a slightly different angle on the matter. He is mainly concerned to decide over what area of land he should spread his available resources. Many of these might be a fixed quantity. He may be able to buy enough seed potatoes to plant any area he wants to establish at any rate he decides on; but there are many factors, such as labour and power, of which the quantities available cannot be increased to any extent, particularly at short notice. Nevertheless, this fixed amount of labour and so on can be applied to an acreage that it is possible to adjust to an appreciable extent. In effect, the labour might be static, but the acreage of land on the farm might not be fully used. It is then, perhaps, a question of deciding whether to plant a large area and allow the standard of cultivation to fall or to concentrate on a small area, and farm more intensively. This is particularly relevant to present conditions, as there is a tendency, for which there is some justification, to establish the maximum possible area of a crop according to some more or less reasonable standard of culture that it is thought will pull the crop through; then to trust to luck that the weather and a happy combination of circumstances will be kind enough to overcome any difficulties in attaining the standard of cultivation the farmer has set himself. Difficulties which may arise, because of a misjudgment of labour requirements, are breakdown in machinery, unfavourable weather conditions, and so on. The prevailing tendency to attempt too much is probably to be preferred to the opposite course, but it is just as well to keep in mind that it can be overdone. There is no advantage in trying to cultivate more than can be handled economically by existing resources. The aim should always be maximum output with the least possible input.

Balanced Cropping.

In the application of the law of diminishing extra returns to the farm business, the farmer will find that if he makes sure to utilize the factors of production which are not being taken away from other production on his farm in such a way as to ensure that the value of the increased return is greater than the cost of the extra applications, allowing for reasonable contingencies, he will not go far wrong. The main thing to understand is that it is the latter portion of a high-yielding crop which costs the most; that it is the last few pounds of meat on the beast which takes the most feed; that it is the last few pounds of butter which are the most difficult to obtain; in other words, that high yields *might* mean efficient technique but poor economy. It would obviously depend, among other things, on the prices of the product. The higher the price, the more a farmer can afford to cultivate intensely and the more economical it is to do so.

Extra Returns—And Extra Cost.

The necessity for watching that the value of extra returns is greater than the extra costs incurred is quite easy to grasp, notwithstanding that it is sometimes forgotten. Far more difficult is the position that arises when extra applications of labour, machinery or capital can only be given at the expense of some other enterprise on

the farm. In such a case, the foregoing formula would not apply. In enterprise A, the farmer might utilize more labour than his present practice allows for and still make a profit over the extra cost; but in order to do so he might have to draw the labour from enterprise B. The question arises then: Which is the more profitable use to which the labour can be put, in enterprise A or in enterprise B? To provide adequate quantitative data for precise judgments on problems such as this, there would need to be fairly comprehensive research into the input and output relationships of the various crop and stock enterprises. Such research would fix the levels of the most profitable intensity of culture under various conditions.

Value of Farm Records.

In the absence of the help that would be obtained from such studies, the farmer has to be guided by his own experience and observation. The value of farm records and records of average performances of men and machinery in the district showing the results which might be attained from different degrees of intensity of culture is obvious, and would be a very useful guide for problems of this nature. In the meantime, at least it can be said that thinking along these lines is well worth while. An appreciation of the operation of the law of diminishing extra returns does help to provide a corrective influence to the tendency to trust too much to luck and good fortune, even if its application can only be rough and ready at the present stage in our knowledge of the economics of farm production.

Summary.

The lessons which the law of diminishing extra returns have to offer are:—

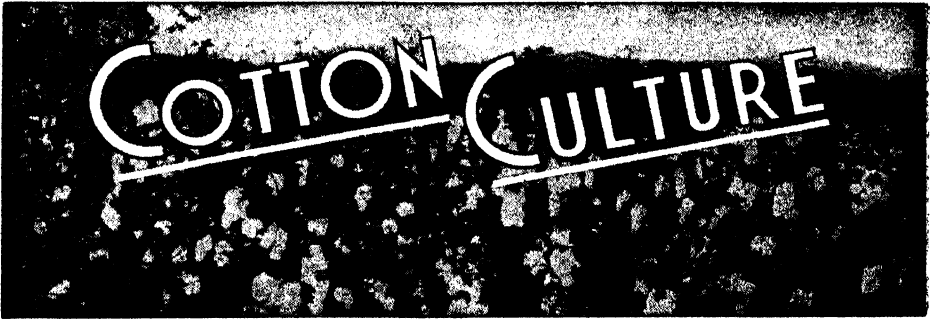
(1) Maintain contact with the latest results of technical research in whatever branch of farming a farmer may be interested.

(2) Always use whatever information and experience is available to ensure that extra costs incurred are covered by the extra returns obtained.

(3) For any given conditions of price, skill and production technique, there is an optimum intensity of culture that is the ideal to be aimed at. In other words, there is an optimum amount of land that should be used with a certain amount of other factors of production.

(4) That over much diversification of effort might defeat its own object if it results in inability to apply specialized knowledge most effectively, or in having a lot of capital tied up in machinery which cannot be put to full use, or in having too much lost time as a result of breaking off and starting different jobs.

Perhaps efficiency is not the be all and end all of farm life, but in these strenuous days every little that the farmer can do towards the more economic utilization of resources helps the food problem. There are many ways in which a little effort will prevent waste—making sure that seed has a good germination to avoid wasted effort in planting; sparing a few minutes every day for the greasing, oiling and maintenance of machinery will yield definitely increased extra returns; reducing the number of turns for the tractor and implements to a minimum by adjusting the way paddocks are planted; keeping all cutting edges sharp; these are all ways in which labour and other effort can be reduced. Above all, it is always wise to keep mentally alert to the opportunities for more effective performance not only of physical operations but also of the tasks of management.



The Best Time to Plant Cotton.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

THE results obtained in investigations and in commercial plantings generally in the districts south of Mackay indicate that the best time to plant cotton is roughly from late September to mid-October in the Central district and from mid-October to mid-November in the areas south of this district. Some modification of these generalisations may be required, however, according to the type of soil on which cotton will be grown and the variety of cotton planted.

Generally speaking, the best results can be expected from rain-grown cotton in districts where this crop is grown on land that has not been cultivated more than three years following a pasture of either native grasses or Rhodes grass. There is a better balance of the plant foods required by cotton in such cultivations, than usually exists in old cultivations, particularly those on fertile alluvials or on soils originally under softwood scrub. Consequently, there is less tendency for cotton grown during the first three seasons after grassland to make the rank growth of plant that frequently occurs on the fertile old cultivations. This lesser tendency to make rank growth on the newer cultivations allows of a wider range of times of planting than those indicated above, producing satisfactory yields, particularly when suitable quick-maturing varieties are planted. It is undoubtedly advisable, however, to plant in the indicated periods, if at all possible.

Where it is not possible to grow cotton following grassland, it is strongly recommended that everything practicable be done to provide a good supply of subsoil moisture and to enable the planting of the cotton being done after the first suitable rain experienced in the above recommended periods. This particularly applies to fertile alluvial soils where there is always a danger of rank growth developing in late-planted crops if very wet conditions prevail during the first part of the "wet" season. This danger also applies to crops that will be grown with supplementary irrigation. Most of such plantings will be on fertile alluvial soils and it is highly advisable to apply the pre-planting irrigation in time to plant by mid-October.

No advantage appears to be obtained under normal spring conditions by planting in August or even early September. While the day temperatures may be satisfactory, the night temperatures during these periods are usually so low as to retard both germination and the early growth of the resultant seedlings. Consequently, plantings made in these periods may yield less satisfactorily than plantings made in late September or early October, for the latter may produce a better stand of fast-growing seedlings than is normally true of earlier plantings.

In some seasons a very heavy loss of terminals may occur through insect attacks in the plantings made in August and September, especially when planting is done on an isolated storm providing just enough moisture to enable a stand to be obtained and barely maintained. Under such conditions, if further rain is not experienced within a fortnight, little green growth persists other than the cotton seedlings. Various insect pests may, therefore, concentrate on the early plantings of cotton with a resultant destruction that may involve up to nearly 100 per cent. of the terminals as well as many of the seedlings. If good, heavy rains occur at planting time or soon after where planting is done following a light storm, the danger of seedling damage does not appear to be so great because the plants quickly outgrow the dangerous period for insect attacks.

It may be advisable, therefore, if a good soaking rain occurs about mid-September in the Central district or during the latter part of that month in the districts south thereof to plant after this rain, particularly if there is sufficient subsoil moisture to maintain the resultant seedlings for an extensive period. Undoubtedly, when the crop gets off to an early start under conditions conducive to the plants making satisfactory development, the prospects of producing a profitable crop are greatly enhanced. This was demonstrated in the 1943-44 season at the Biloela Research Station, when plantings made on the 8th September on land which had been in Rhodes grass for three seasons and was ploughed in March to conserve the subsoil moisture resulting from the summer rains yielded 1,131 lb. seed cotton per acre, compared with 812 lb. produced by adjacent plantings on the 6th October. Plant examinations at the end of January following three weeks of very hot, dry weather indicated that, although severe shedding of squares and young bolls had occurred in both times of planting, the bolls in the September-planted crop were appreciably larger than in the October planting. Apparently the earlier squaring and flowering in the earlier planting had allowed many of the resultant bolls to develop normally before the onset of the stress conditions.

The production of larger bolls in the earlier plantings may not only improve yields but may also enable better picking tallies to be obtained than is possible when the bolls are reduced in size by adverse conditions. It is pointed out, however, that the early setting of a heavy crop in the early plantings may adversely affect the development of the crop during prolonged dry weather experienced at mid-season, unless there is a good supply of subsoil moisture to assist the plants to withstand such conditions long enough to mature a satisfactory portion of their crop.

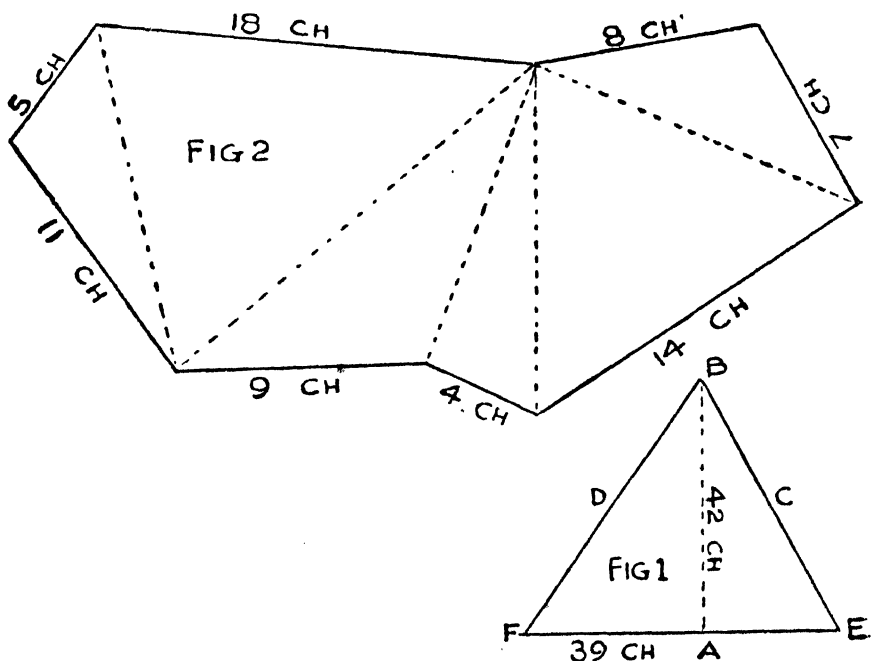
Summary.

The best time to plant cotton in the areas south of Mackay is from late September to mid-October in the Central district and from mid-October to mid-November in the districts south of that area. Where cotton is planted during the first three seasons following grassland, slightly later plantings can normally be expected to produce reasonably satisfactory yields, particularly when suitable quick-maturing varieties are grown. Where cotton is to be grown on old fertile alluvial cultivations, either with or without the assistance of supplementary irrigation, it is definitely advisable to plant around mid-October if at all practicable. Later plantings on such soils may make rank plant growth if very wet weather is experienced in the early part of the regular wet season, and, as a result of such growth, may suffer a severe loss of crop through either following stress conditions or insect pest attacks, or both.

GADGETS AND WRINKLES

MEASURING IRREGULAR PADDOCKS.

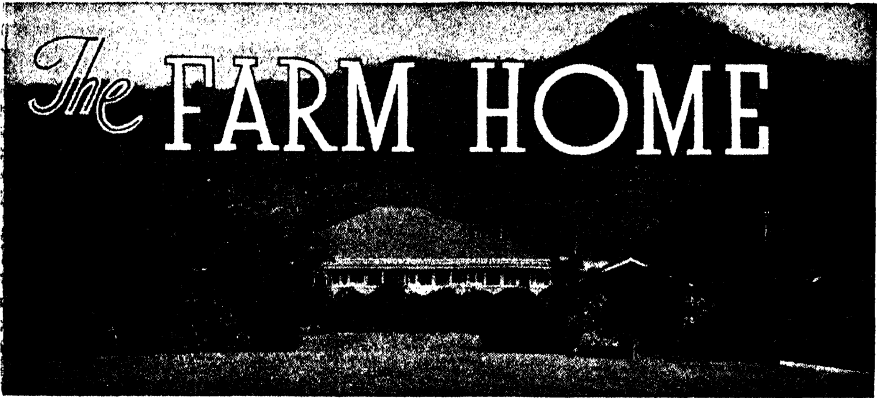
To find area of paddock with several sides of unequal length, the first step necessary is to divide the paddock into convenient triangles. Multiply the base of each triangle by altitude and divide the product by 2. Repeat the process for each triangle



and add totals together. Any side of triangle may be called the base. Altitude is the shortest distance between the base and highest point of triangle. In Fig. 1, F E is taken as the base. The shortest distance from F-E to B is from point A, a distance of 42 chains. Thus length of the base—59 chains—must be multiplied by the altitude—42 chains, and product—2,478—divided by 2 gives the area of the triangle as 1,239 square chains. Thus the acreage is 123 acres 9 square chains. Working is as follows:—

$$\begin{array}{ccccccc} 59 & 42 & 1 & 2,478 \\ - & \times & - & \times & - & = & - \\ 1 & 1 & 2 & 2 & & & \end{array} = 1,239 \text{ square chains.}$$

If desired, F-B could have been taken as base. In this case the altitude would have been from point D to E. Or if side B-E had been called base, altitude would have been from point C to F. Fig. 2 shows how triangles are determined.



Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE CARE OF THE BABY'S SKIN.

NO matter how large or how small the baby may be on arrival, his body will be entirely covered with skin. This covering is in infancy extremely delicate and easily injured and must therefore be handled with great care. The skin has two very important functions—one is to protect the body, and the other to assist the body to throw off waste materials. It will be readily seen that only when the baby's skin is whole is the body safe, because if it should become broken some harmful germs may slip in and set up a local infection or even enter the blood stream and poison the baby's system.

When the baby is born his skin is covered with a protective layer of grease, and this is usually removed with oil soon after birth. Unless the baby is premature or otherwise weakly, he is soon introduced to his first bath which is given with warm water and soap. Soaps which contain a large amount of soda or are highly perfumed should not be used—an olive oil soap, such as castille, is probably the best.

Do not forget that the skin breathes. It is filled with minute pores from which is given off perspiration. Daily baths are needed regardless of the time of the year, in order that the skin may be cleared of perspiration and lifeless skin cells and given a chance to breathe properly.

A mother with a first baby is often afraid of bath time because she is unused to handling such a small wriggling scrap of humanity, and if she did not receive proper instruction in this procedure before her baby came along she should ask her nurse to allow her to bath the baby under supervision so that she will not be nervous when left to do it by herself. It is advisable to give the bath at the same time each day, and it should be arranged a little while before a feed is due, certainly not within an hour after a feed.

The mother should have everything in readiness before undressing the baby, because the bath must not be too prolonged, as the baby's large skin surface causes him to chill easily. Choose a place sheltered from draughts, and in winter, if a warm sunny room is not available, some artificial heating will be required. In the summer a sunny corner of the verandah may be used, as the sun on the baby's skin is good, but even in warm weather he should be screened from direct draughts. The very young baby usually cries vigorously while being bathed, but after a few weeks, if the mother handles him well, he learns to enjoy his bath.

The drying after the bath is most important in the care of the baby's skin and must be very carefully done. Pay special attention to creases and folds of skin and also to the backs of the ears. If left damp these places are apt to become

sore. The application of powder should never take the place of drying, as powder applied over a moist skin may cause chafing. It is better to wipe the napkin area with a little pure oil rather than to use powder, as the baby's skin easily becomes sore from wet or soiled napkins, and the oil acts as a protection.

It was once believed that the mouth should be cleaned every day. Now it is recommended that the sensitive mucous membranes should be left strictly alone, because many mothers have infected their babies' mouths by breaking the membrane with sharp finger nails or otherwise. Nature will keep the mouth clean with the saliva until the baby gets his teeth. The membrane which lines the baby's ears and nose is tender, too. Never poke at these parts with hair-pins or similar articles. If cleansing is required a little cotton wool twisted to a point and dipped in oil will do the job quite well.

Next month's advice will deal with some common skin irritations. In the meantime, questions on this or any other subject concerning maternal and child welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters 'BABY CLINIC, Brisbane.' These letters need not be stamped.

IN THE FARM KITCHEN.

The Ever Useful Tomato.

Tomato Relish.

Ingredients:—3 lb. ripe tomatoes, 1 lb. onions, 1 lb. sugar, 1 tablespoonful curry powder, $1\frac{1}{2}$ tablespoons mustard, 2 tablespoons flour, salt and pepper to taste. *Method:*—In making the relish, scald the tomatoes first by immersing them in boiling water for a few minutes, then immediately dip them into cold water; this process loosens the skins and they may be quickly and easily peeled without waste. Peel and slice the onions. Put all into a bowl, sprinkle with the salt, and allow to remain overnight, and next morning put into the preserving pan with just sufficient vinegar to cover; add the sugar and boil gently for about 1 hour, then moisten the dry ingredients with a little cold vinegar and stir them into the mixture. Boil all together for another hour or until of a nice consistency.

Ripe Tomato Chutney.

Ingredients:—4 lb. ripe tomatoes, 2 lb. apples, 1 lb. onions, $\frac{1}{4}$ lb. sultanas, 2 level teaspoons salt, $\frac{1}{4}$ teaspoon pepper, $\frac{1}{2}$ dozen cloves, 1 small piece whole ginger, 3 small chillies, $1\frac{1}{2}$ pints vinegar, $1\frac{1}{2}$ lb. sugar, 1 teaspoon mustard seed. *Method:*—Peel, core, and cut up the apples, peel and slice the onions, and tomatoes. Tie the cloves, ginger (bruised), and chillies in a spice bag and simmer till a good consistency (about 2 hours).

Spiced Tomato Butter.

Ingredients:—5 lb. nice red tomatoes, $1\frac{1}{2}$ lb. apples, 4 lb. sugar, 1 pint vinegar, $\frac{1}{4}$ -oz. stick cinnamon, $\frac{1}{4}$ oz. ginger, 2 blades mace, few cloves. *Method:*—Cook the mixture rather slowly for about 3 hours or until all ingredients are nicely blended.

Tomato Sauce (1).

Ingredients:—Take a quantity of tomatoes, say, about 20 lb., and pulp them by boiling rapidly until quite soft (no water should be added, but the tomatoes should be slightly crushed to commence the boiling). Pass the pulp through a sieve which will retain only the seeds and skins, then measure the strained pulp, and to each gallon of this allow 4 oz. salt, $1\frac{1}{2}$ lb. sugar, $1\frac{1}{2}$ oz. garlic, 1 oz. allspice, 1 oz. cloves, 1 tablespoon mustard, $\frac{1}{2}$ teaspoon cayenne, 1 quart good vinegar. *Method:*—The whole spices may be suspended in a loose muslin bag while being boiled and removed at finishing point. The sauce is then boiled until of a right consistency, which may be tested by placing a little of the hot sauce on a plate, and if no watery liquid separates from the solid sauce, it is ready for bottling off into hot sterilized sauce bottles, and, when bottled, should be cooled off at once.

Tomato Sauce (2).

Ingredients:—40 lb. tomatoes, $2\frac{1}{2}$ lb. cored and peeled apples, 3 lb. sugar, 6 oz. salt, $1\frac{1}{2}$ teaspoons cayenne pepper, 2 quarts vinegar, 2 oz. cloves, 2 oz. black pepper, 2 oz. allspice, 2 oz. garlic. *Method:*—Boil tomatoes and apples $1\frac{1}{2}$ to 2 hours. Strain well. Stand overnight in an enamel or china bowl. The next day boil all ingredients for 5 or 6 hours, tying spices in a muslin bag.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JULY RAINFALL

(Compiled from Telegraphic Reports).

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	July.	No. of years' records.	July, 1944.	July, 1943.		July.	No. of years' records.	July, 1944.	July, 1943.
<i>North Coast.</i>					<i>South Coast—contd.</i>				
Atherton	In.		In.	In.	Gatton College	In.		In.	In.
Cairns	1.12	42	2.38	0.22	Gayndah	1.37	44	3.70	..
Cardwell	1.53	61	2.54	0.04	Gympie	1.47	72	2.14	0.09
Cooktown	1.38	71	3.19	0.09	Kilkivan	2.07	73	4.31	0.04
Herberton	0.98	67	2.87	0.35	Maryborough	1.50	62	2.02	0.07
Ingham	0.89	57	1.75	0.05	Nambour	1.93	72	4.36	0.02
Innisfail	1.69	51	3.25	0.47	Nanango	2.67	47	6.40	0.03
Mossman	4.75	62	6.58	1.46	Rockhampton	1.65	61	1.82	0.06
Townsville	1.19	19	5.73	0.77	Woodford	1.73	72	2.23	0.11
	0.67	72	1.24	..		2.28	55	5.48	..
<i>Central Coast.</i>					<i>Central Highlands.</i>				
Ayr	0.73	56	0.28	..	Clermont	1.06	72	1.31	..
Bowen	0.93	72	0.28	..	Springsure	1.18	74	1.05	..
Charters Towers	0.67	61	0.99	..					
Mackay	1.64	72	0.57	0.02	<i>Darling Downs.</i>				
Proserpine	1.58	40	0.84	..	Dalby	1.71	73	2.44	0.27
St. Lawrence	1.36	72	1.55	0.04	Emu Vale	1.57	47	2.21	0.58
					Jimbour	1.48	64	3.29	0.09
<i>South Coast.</i>					Miles	1.62	58	1.54	0.26
Biggenden	1.41	44	2.02	..	Stanthorpe	2.00	70	3.01	1.27
Bundaberg	1.83	60	2.82	..	Toowoomba	2.06	71	3.44	0.32
Brisbane	2.16	91	4.05	0.16	Warwick	1.80	78	2.81	0.62
Caboolture	2.37	67	5.89	..					
Childers	1.70	48	2.00	0.10	<i>Maranoa.</i>				
Cromhurst	2.90	50	8.14	0.09	St. George	1.21	62	2.13	0.48
Esk	1.90	56	3.48	0.18	Roma	1.43	69	2.12	0.16

CLIMATOLOGICAL TABLE FOR JULY, 1944.

Compiled from Telegraphic Reports.

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	SHADE TEMPERATURE.		EXTREMES OF SHADE TEMPERATURE.				RAINFALL.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
<i>Coastal.</i>									
Cairns	In.	Deg. 77	Deg. 64	Deg. 81	10, 11	Deg. 58	15	Points. 254	8
Herberton .. ..	..	69	49	77	12	41	15, 16, 17	175	6
Townsville .. ..	..	76	59	79	11, 12	49	21	124	5
Brisbane	30.19	68	49	79	30	39	20	465	13
<i>Darling Downs.</i>									
Dalby .. ..	..	67	43	76	6, 7	25	21, 22	244	6
Stanthorpe .. ..	..	59	38	69	6, 7	19	21, 22, 20	301	11
Toowoomba .. ..	..	60	45	71	30	32		344	14
<i>Mid-Interior.</i>									
Georgetown	30.03	80	58	86	5	45	16	119	2
Longreach	30.20	75	47	82	29, 30, 31	36	21	110	4
Mitchell	30.24	66	41	75	30	26	21	232	3
<i>Western.</i>									
Burketown .. ..	..	80	56	87	4, 5	48	14	139	2
Boulia	30.15	70	46	79	3, 28, 29	37	21	99	3
Thargomindah	30.21	68	42	80	29	34	23	64	2

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.**SEPTEMBER.****TIMES OF SUNRISE AND SUNSET.**

At Brisbane.			CORRECTION IN MINUTES FOR OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
1	6.03	5.33	Cairns	+ 26	+ 32	Longreach	+ 34	+ 36
6	5.58	5.36	Charleville	+ 27	+ 27	Rockhampton	+ 9	+ 11
11	5.52	5.38	Cloncurry	+ 48	+ 52	Roma	+ 17	+ 17
16	5.46	5.40	Cunnamulla	+ 28	+ 30	Townsville	+ 23	+ 27
21	5.40	5.42	Dirranbandi	+ 19	+ 19	Warwick	+ 4	+ 4
26	5.35	5.45	Emerald	+ 18	+ 20	Winton	+ 38	+ 42
30	5.30	5.46	Hughenden	+ 34	+ 36	Quilpie	+ 35	+ 35

TIMES OF MOONRISE AND MOONSET.

At Brisbane.			CORRECTION IN MINUTES FOR SOUTHERN DISTRICTS.							
			Charleville + 27; Cunnamulla + 29; Dirranbandi + 19; Roma + 17; Quilpie + 35; Warwick + 4. (Corrections to be added to both times of Rising and Setting.)							
			CORRECTIONS IN MINUTES FOR CENTRAL DISTRICT.							
Date.			Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	p.m.	a.m.								
2	3.45	4.36								
3	4.53	5.27								
4	6.02	6.15								
5	7.10	6.59								
6	8.17	7.42								
7	9.21	8.23								
8	10.25	9.05								
9	11.29	9.48								
10	a.m.	10.33								
11	12.25	11.20								
12	p.m.	12.10								
13	1.23	1.02								
14	2.15	1.55								
15	3.04	1.55								
16	3.48	2.48								
17	4.28	3.41								
18	5.05	4.34								
19	5.40	5.25								
20	6.13	6.16								
21	6.44	7.07								
22	7.16	7.59								
23	7.49	8.52								
24	8.24	9.45								
25	9.02	10.40								
26	9.44	11.37								
27	10.31									
28	a.m.	12.33								
29	11.23	12.33								
30	p.m.	12.33								
1	12.21	1.29								
2	1.24	2.23								
3	2.30	3.14								
4	3.37	4.02								

CORRECTIONS IN MINUTES FOR NORTHERN DISTRICTS.									
Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.		
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.	Set.
1	+ 45	+ 11	+ 61	+ 38	+ 46	+ 23	+ 38	+ 11	
2	+ 37	+ 19	+ 55	+ 44	+ 40	+ 20	+ 33	+ 18	
3	+ 26	+ 29	+ 48	+ 50	+ 34	+ 35	+ 23	+ 25	
4	+ 17	+ 38	+ 40	+ 56	+ 28	+ 41	+ 16	+ 33	
5	+ 11	+ 45	+ 38	+ 61	+ 23	+ 46	+ 10	+ 38	
6	+ 10	+ 49	+ 37	+ 63	+ 23	+ 48	+ 9	+ 40	
7	+ 10	+ 47	+ 37	+ 62	+ 23	+ 47	+ 10	+ 39	
8	+ 14	+ 42	+ 40	+ 59	+ 27	+ 44	+ 14	+ 36	
9	+ 21	+ 35	+ 44	+ 55	+ 29	+ 39	+ 18	+ 30	
10	+ 29	+ 27	+ 50	+ 51	+ 35	+ 36	+ 25	+ 24	
11	+ 36	+ 19	+ 55	+ 44	+ 40	+ 29	+ 32	+ 18	
12	+ 43	+ 12	+ 60	+ 38	+ 44	+ 24	+ 36	+ 12	
13	+ 48	+ 9	+ 64	+ 36	+ 48	+ 23	+ 40	+ 9	
14	+ 50	+ 8	+ 65	+ 35	+ 49	+ 22	+ 42	+ 8	
15	+ 39	+ 16	+ 56	+ 41	+ 42	+ 26	+ 33	+ 15	

NOTE.—The plus sign (+) means later than Brisbane time.

PHASES OF THE MOON.

Full Moon, 3rd September, 6.21 a.m.; Last Quarter, 9th September, 10.03 p.m. New Moon, 17th September, 10.37 p.m.; First Quarter, 25th September, 10.07 p.m.

PLANETS

Venus—Observable low in the west during evening twilight in the constellation of Virgo. It passes close to Mars on the 10th and close to Spica on the 22nd.

Mars—Observable low in the west during evening twilight in the constellation of Virgo. At the end of the month it is too close to the Sun for observation. Passes close to Spica on the 30th.

Jupiter—Late in the month, observable low in the east during morning twilight; in the constellation of Leo.

Saturn—Observable in the east in the morning hours, rising an hour or so after midnight. During the month this planet is in the constellation of Gemini.

SPRING EQUINOX.

The Spring Equinox for the Southern Hemisphere occurs at 2 p.m. on 23rd September. On this day the Sun will rise and set at the true east and west points respectively. As the word "equinox" signifies "equal night" it may be expected that the day and night

will be equal; but there is so much daylight before sunrise and after sunset (twilight) that much of the meaning is lost. However, the Sun is above the horizon for half the 24 hours at this time of the year.

For most people this is a welcome time. Winter has passed, and there is evidence of new growth; although in the milder zones evidence of Spring will have been visible for some time. The astronomical commencement of Spring, however, is the Spring Equinox. Often in this hemisphere the "Harvest Moon" is falsely associated with the September Equinox, because the Full Moon nearest the September Equinox is known as the "Harvest Moon" in the Northern Hemisphere. It must have been noticed by almost everyone that the Moon rises on an average about three-quarters of an hour later every day. At the time of the September Equinox, however, the Full Moon is at that part of its orbit where it is moving north most rapidly. This condition to those in the Northern Hemisphere reduces the difference between the times of daily rising of the Moon to a minimum, and to those in the Southern Hemisphere increases the daily difference to a maximum—*e.g.*, the nearest Full Moon to the equinox this year is 2nd October, and the daily differences for English latitudes from 1st October to 5th October are 22 minutes, 22 minutes, 24 minutes, 29 minutes, a total of only 97 minutes in four days. For the same latitude in the Southern Hemisphere, however, the differences are 97 minutes, 97 minutes, 95 minutes, 90 minutes—over 90 minutes in one day. The greater the distance from the Equator, the more marked this phenomenon becomes. In Queensland, where the latitude is less than 30 degrees, the effect is not very noticeable—66 minutes, 66 minutes, 65 minutes, 64 minutes over the same period stated above. The effect of this Full Moon rising for several evenings so close to sunset is of immense help to harvesting operations in England, which must be carried out quickly, and full use is made of the bright Moon. The nearest Full Moon to the September Equinox thus was known as the "Harvest Moon." The following Full Moon, where the conditions are similar but less marked, occurs during the hunting season and became known as the "Hunter's Moon."

At the March Equinox the reverse conditions take place. The maximum difference between daily times of rising of the Moon then occurs in the Northern Hemisphere and the minimum difference to observers in the Southern Hemisphere. In this country, however, harvesting is well over by March and no advantage comes from the phenomenon as does from the September Moon in the fields of England.

AUGUST WEATHER IN QUEENSLAND.

Normally dry conditions prevailed in the Lower Carpentaria, Upper and Lower West and North Coast, Barron, otherwise the greater part of the State received useful to very beneficial rain, varying from 10 per cent. above average in the Central Lowlands to 260 per cent. and 337 per cent. in the Maranoa and far South-West. Rain periods were chiefly in the first and third weeks, especially the latter, and were due in great part to mild out-of-season monsoonal influences with their usual accompanying soaking falls and local thunderstorms. In the dry southern interior many good 2 to 3-inch aggregate totals followed previous partial but belated relief. Throughout most of the State, a normal sequence of early spring and summer storms should maintain the present fair to good prospects.

Temperatures.—Maximum temperatures ranged from 0.7 degrees below normal at Rockhampton and Thargomindah to 2.3 degrees above at Longreach. Minimum temperatures below normal at Cloncurry, 1.8 degrees Boulia and Rockhampton, otherwise in central and southern districts the range was from 1.6 degrees above at Thargomindah to 3.7 degrees at Stanthorpe. Mean minimum at Mitchell, 42 degrees, was the fourth highest on record.

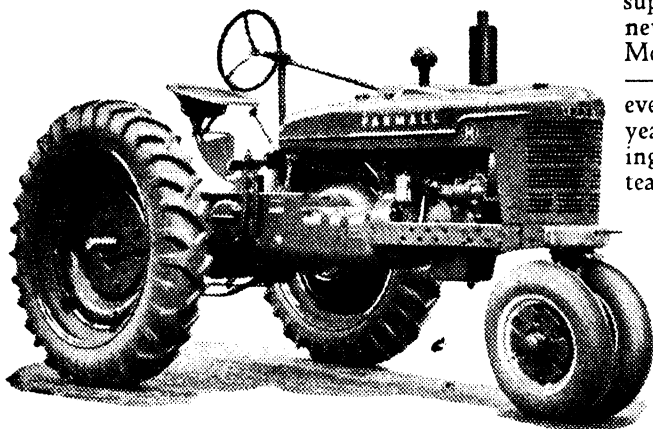
The rain position is summarised below:—

Division.	Normal Mean.	Mean August, 1944.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	20	23	15 above
Peninsula South	7	13	86 "
Lower Carpentaria	10	1	90 below
Upper Carpentaria	25	38	52 above
North Coast, Barron	114	76	33 below
North Coast, Herbert	167	240	44 above
Central Coast, East	77	80	4 "
Central Coast, West	50	86	72 "
Central Highlands	84	113	35 "
Central Lowlands	48	53	10 "
Upper Western	16	3	81 below
Lower Western	32	24	25 "
South Coast, Port Curtis	118	141	20 above
South Coast, Moreton	169	203	20 "
Darling Downs East	131	272	108 "
Darling Downs West	88	250	184 "
Maranoa	91	328	260 "
Warrego	75	195	160 "
Far South-West	49	214	336 "

MCCORMICK-DEERING FOOD WEAPONS

HERE on the home front in history's greatest battle for FOOD, every farm tractor is mobilized for service. Every operator "drives a weapon" in this war for Victory and Freedom. Our soldiers, our civilians, the people of Britain, and the peoples of the liberated nations must have food—meats, butter, vegetables and fruits—in ever-increasing quantities to help win and hold the peace for which our boys in uniform are fighting. Therefore, our Government has specially imported

supplies of new tractors. These new tractors include the latest McCormick-Deering models—"Food Weapons" with everything that more than 30 years of experience of building and using tractors can teach in *efficiency, economy, and adaptability* for Food Production.

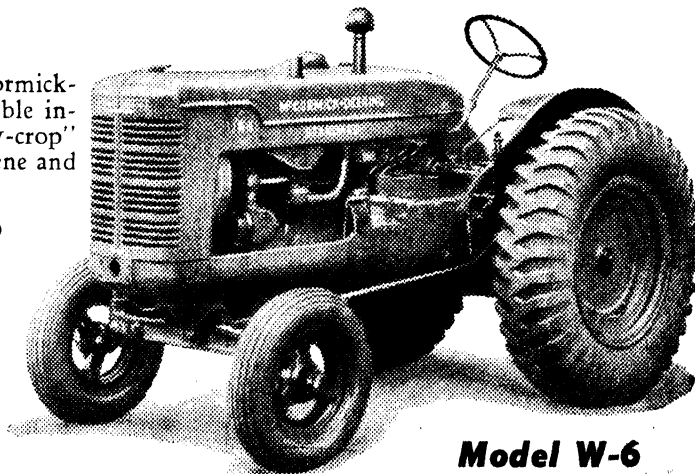


Farmall-H

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QUEENSLAND AGRICULTURAL JOURNAL

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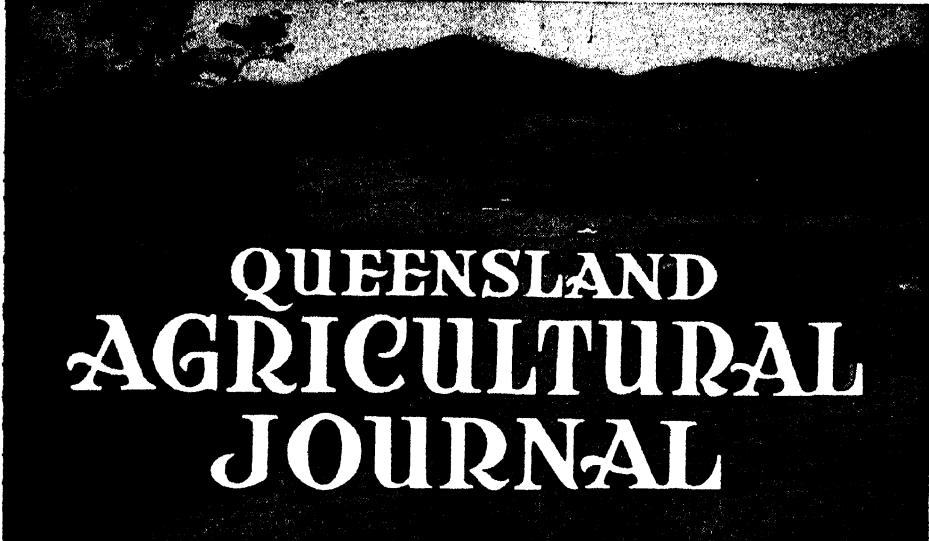
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QUEENSLAND AGRICULTURAL JOURNAL

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Part 4

Event and Comment.

Primary Production in Queensland.

In the Annual Report of the Department of Agriculture and Stock for the year ended 30th June last, the general pastoral and agricultural situation is reviewed. Subjoined is a brief summary of the main points of the report:—

The statistical position of the major branches of animal husbandry in Queensland is indicated in the following figures:—Sheep, 23,255,584; cattle, 6,524,550; horses, 387,018; and pigs, 450,391. In the sheep pastoral districts, conditions generally were normal except in the South-West, where scrub and supplementary feeding became necessary on many holdings. Flock losses occurred in places; and to ensure their survival, ewes were frequently left unmated. As compared with the previous year's figures there was a decline in the number of sheep. There was also a slight decline in average fleece weight, largely because of prevailing unfavourable conditions in the South-West area. Fat sheep deliveries decreased slightly, but the condition of the consignments was generally satisfactory. Values varied somewhat, but recent prices were as high as 6d. a lb. dressed weight, plus skin value. There was little increase in the number of fat lambs marketed, but their quality was evidence of good breeding and fattening at the right age. Naturally, the weather and its effects on growing fodder crops has an influence on lamb fattening practice and flockowners in parts of the fat lamb raising districts were at a disadvantage in that regard. Registrations of stud flocks are increasing. They include Merino, Corriedale and British breeds—a very encouraging indication of progress. Field days were held in several sheep pastoral centres for the purpose of giving practical demonstrations in stock disease and pest control. Sheep breeders are taking a keener interest in this important branch of flock

management. Wool appraisals totalled 610,514 bales, valued at approximately £13 million. Production was above normal. Under the Departmental Farmers' Wool Scheme assistance to small flockowners in the get-up and marketing of their clips was continued. The number of bales classed and appraised was 562 and the average price obtained was 13.72 pence per lb.

Cattle values remained at a high level throughout the year and were reflected in increased numbers of stud and herd stock introduced. The demand for both fat and store cattle continued keen. Good quality horses of all classes were in strong demand at good prices. Generally, the condition of livestock was fair, and there were no abnormal losses from disease.

The downward trend in sugar production which started in 1940 continued, and in the 1943 season only 486,447 tons at 94 n.t. were produced. The cane harvested amounted to 3,397,424 tons, consequently 6.98 tons of cane were required to produce one ton of sugar. Shortages of labour, fertilizer and equipment for cultivation were the main reasons for the low tonnage produced. The average price of sugar was £21 ls. 3d. per ton, compared with £18 3s. 11d. for the previous season's output, and the value of the crop was therefore approximately 10½ million pounds—about £1 million pounds lower than that of 1942.

Climatic conditions were generally favourable in the main cotton growing districts, but in the South Burnett and southern and western areas were less conducive to high production because of excessive wet weather in December. Many farmers averaged yields of 700 lb. of seed cotton to the acre or better and, in some instances 1,200 to 1,500 lb. to the acre. The work of developing improved strains of commercial cotton varieties was continued and some very promising results were obtained. Insect pests were not an important limiting factor in respect of crop yields in the 1943-44 season.

The wheat yield was above average and slightly better than that of the previous year, even though the acreage was smaller. The aggregate yield of over 5 million bushels was, considering all circumstances, highly satisfactory. Although the maize acreage was slightly below average, the total yield of 4½ million bushels was above average. The quality of the grain was excellent and, as with other grains, high values were maintained throughout the season. Grain sorghum production has become a well established industry with an expanding acreage. The yield approximated 1,400,000 bushels. Potato production was a record. In the southern districts, the acreage planted was 15,800, from which a return of 30,680 tons was obtained. In North Queensland, sufficient seed was supplied to sow about 2,000 acres and the prospective yield should not be less than 5,000 tons. Although seasonal conditions were unusually favourable for fodder crop production during the greater part of the year, the quantity of ensilage made was the least for many years. Substantial hay reserves were held, however, on many farms.

Butter output was 101,416,297 lb., valued at £8,546,992, in comparison with 111,511,198 lb., valued at £8,313,827 for 1942-43. Seasonal and wartime circumstances, as detailed in the report of the Director of Dairying, were against the attainment of the butter production objective of 51,000 tons. Despite all unfavourable conditions, however, high standards of quality were maintained.

Cheese production was 24,041,648 lb., valued at £1,159,250, as against 27,730,083 lb., valued at £1,213,183 for the previous year.

Field Crops

Broom Millet.

E. R. HASELER.

BROOM millet is not grown for stock feed, the brushes on which the seed is borne constituting the valuable part of the plant, although both the seed and the stalks have some feed value. The brushes are used in the manufacture of various types of household brooms, of which there is a war-time scarcity.

The acreage under broom millet in Queensland varies considerably according to the seasonal conditions, and is also influenced by fluctuations in the prospects of obtaining profitable prices for the brushes. Because of the limited demand for the brushes in Australia and to the fact that this crop can be produced in other States, over-production occurs at times. This results in a lowering of the returns to the growers, which may be sufficiently serious to cause a reduction in the acreage in this State in the season following that in which low prices had ruled. This variation in crop production and prices tends to affect adversely the development of the broom millet growing industry in Queensland.

Soil Requirements.

Broom millet should be grown on the most fertile alluvial loams of high moisture-holding capacity in order that the plant may make a rapid unchecked growth. The average returns that may be expected in normal times from this crop in most of the broom millet growing districts of the State influences numbers of farmers, however, to devote their fertile alluvial soils to other crops, such as maize, potatoes, pumpkins, and lucerne, which, as a rule, are more profitable than broom millet. Having greater ability to withstand dry conditions than most of the crops just mentioned, broom millet is then often sown on the slopes and on the poorer soils where these crops will not usually yield profitably. Plants on such soils require a more regular distribution of the rainfall than do plants on the fertile alluvial loams and clay loams, hence the yield and the quality of broom millet brushes produced on the slopes and the poorer soils may fluctuate appreciably. Undoubtedly, more definitely suitable soils should be selected for the growing of broom millet if the production of that crop is to be placed on a really satisfactory basis. On some farms, however, it may be necessary to sow the broom millet on the slopes in order that the alluvials can be reserved for the production of fodder crops. In such cases, a suitable rotation should be adopted to increase the fertility of the soil on which the broom millet is to be grown and to improve its

permeability so that a large proportion of the storm rains may be absorbed by the soil. Where such methods are followed, the chances of obtaining satisfactory returns from broom millet under a wide range of climatic conditions will be greatly enhanced.

Preparation of the Seed-Bed.

The methods satisfactorily employed in the preparation of a seed-bed for the sowing of maize also are suitable for broom millet. Because of the necessity of preventing as far as possible, any check on the growth of the broom millet plant, every method of storing moisture in the subsoil, before planting, should be utilised. Where planting is to be done in the early spring, the land should be ploughed in the autumn and left in a rough condition so that the winter rains may be trapped efficiently. Sufficient harrowing and, if necessary, discing should be done through the late winter to control weed growth, and also to gradually firm the seed-bed in time for early planting. With the midseason sown crop, the spring ploughed land should be left in a receptive state for the absorption of rain from early summer storms; and every effort should be made to eradicate weed growth, so that the broom millet seedlings shall not have to compete with weeds for the available soil moisture and plant nutrients.

Time of Planting.

The planting period for broom millet varies according to the district in which the crop is to be grown. It is essential to have fine weather during harvesting, consequently sowings should be so arranged that the crop will be ready for harvesting at a time when weather conditions are likely to be favourable. In the Lockyer Valley and adjacent districts, where most of the broom millet produced in this State is grown, there are, however, two well-defined planting times—namely, August and September for an early crop, and early December for a late one. Crops planted during these months can generally be harvested in more satisfactory weather than is frequently the case with plantings made in other months in the planting period. Moreover the crop has a much better chance of having good growing conditions. The broom millet producer in the areas mentioned plants the early crop on the upper warmer slopes, and the late crop on the more moisture retentive soils of the lower slopes.

Row and Plant Spacing.

Broom millet is sown with one or two row maize planters equipped with plates to sow at the desired spacing of the plants. Usually the rows are spaced $3\frac{1}{2}$ feet apart, but the plant spacing within the rows varies with the time of sowing. Generally, the rate of sowing is that which the experience of the farmer indicates as being likely to give the desired plant spacing for his soil without any thinning of the plants being necessary. As the plants of the early sown crops tend to tiller more than those of the later sowings, a rate of sowing is used in August and September which will space the plants approximately 12 to 15 inches apart. After that, a heavier rate of sowing is used which will leave the plants roughly 9 inches apart. The rate of sowing varies from 2 lb. per acre for the early sowing to as much as 5 lb. for the later plantings.

Cultivation.

The usual methods of cultivation for maize are satisfactory for broom millet. The maintenance of clean cultivation in a broom millet crop is particularly desirable, however, as competition with weed growth for moisture and nutrients during any adverse growing conditions seriously affects the growth of the broom millet plant. This applies particularly during the stage of development of the plant prior to the emergence of the brushes, for then favourable growing conditions are essential for the production of brushes of satisfactory quality.

Head Bending.

The brush of broom millet grows very rapidly during favourable conditions, frequently reaching a length of 30 inches on fertile soils. Any danger of the fibres of the brushes bending because of the weight of the seed can largely be overcome if the brushes are bent over so that the weight of the seed will keep the fibres hanging straight downward and close together. The brushes are bent over when the weight of the seed becomes sufficient to start the fibres of a brush spreading. The operation is done during the hot, sunny part of the day by bending the stalk at a point about 12 inches below the base of the brush, taking care to bend between the joints or nodes of the stalk. The usual procedure is for the operator to hold one arm up in the air with the wrist against the stalk and with the other hand to then bend the stalk down around the wrist, thus preventing the breaking of the stalk or the bending of it at too sharp an angle.

This bending operation is a general practice in some broom millet producing countries such as the United States of America, and could with advantage be practised in Queensland more widely than it is, especially where broom millet is grown on a soil fertile enough to produce a rapid growth of the brushes after good soaking rain.

Harvesting.

The most difficult decision the broom millet grower has to make is the selection of the moment when the crop is in the right condition for harvesting. The best time for harvesting is when the brushes are well developed, but while the fibre still has a nice green tinge, although it is starting to dry out. This stage in the development of the plant is reached before full maturity of the seed is attained, and sound judgment is required to make the right decision as to the suitability of the crop for harvesting. In some seasons, an excessively wet period may make it necessary to harvest before what would otherwise be the correct time, in order to avoid losses caused by moulds attacking the compressed brushes. Again, the occurrence of severe wind storms in crops, in which the brushes have not been bent over, may cause the splitting open of the supporting sheath of the brush, and when this happens it is necessary to harvest as soon as possible in order to prevent the resultant bending of the fibres from becoming permanently fixed. The inexperienced grower of broom millet would be well advised to consult an experienced grower, preferably in his own district, about any of the abovementioned harvesting problems, for by doing so serious losses may be avoided.

In cutting off the brushes, the operator grasps the brush with one hand and cuts through the stalk at least 6 inches below the brush with a suitable cutting instrument, such as a pruning knife. The harvesting should be done on days of bright sunshine in hot, dry weather in order that the curing will be quickly accomplished.

Curing.

The cut brushes are spread out on the stalks which have been bent over for the purpose, care being taken to keep the brushes off the ground so that they may dry out quickly and uniformly. If wet weather threatens, it is necessary to gather the brushes and spread them under cover, as rain both discolours them and may cause the development of moulds. Generally, if harvesting is done in hot, dry weather the brushes are cured sufficiently in two days to allow of their being gathered for the removal of the seed.

Where the curing is done under cover, it will be found that the colour and quality of the brushes are improved, as compared with brushes cured in the field. The cut brushes are first left in the field for a couple of hours to allow some evaporation of moisture to occur, after which they are loosely stacked, about 3 inches deep, on racks under cover. They should be turned at frequent intervals to hasten the drying out and also to prevent the occurrence of heating in any dense brushes. Where the curing is done properly under cover, a tough green brush free of discolouration results which, if of proper length, commands a premium.

Removal of the Seed.

The seed of broom millet is removed by holding the brushes against the rapidly revolving studded drum of a machine commonly called a hackler. The studs or spikes projecting from the drum strip or beat off the seed of the fibres without damaging the latter; in using the hackler the drum should revolve away from the operator. Either hand or power-driven machines may also be purchased for this purpose.

Grading.

It is obviously important that the farmer grade his broom millet brushes carefully according to trade specifications. Green-coloured brush should also be segregated from golden-coloured brush, classing the brushes of each colour into the appropriate grades.

Baling.

The various grades of the different coloured brushes should be baled separately in an ordinary hay press or in a similar type of press. In placing the brushes in the press care should be taken to protect the fibres. The best procedure is to first place a thin layer of the brushes flat in the bottom of the press, with all the butts of the lengths of stalks attached to the brushes facing to one side of the bale. Another thin layer should then be placed on top of the first layer, but with the butts facing to the opposite side of the bale, and with the fibres overlapping those of the previous layer sufficiently to allow the two layers to form the width of the bale. This process is repeated until the press is filled for the compressing of the finished bale. The bales are usually tied with three strands of No. 10 gauge wire. It is advisable also to use cross strands of soft tie wire to prevent the two outside wires from slipping

off the bale. The size of the bale varies according to the grower's requirements, but one with dimensions of 36 inches in length, 18 inches in depth and 30 inches in width weighing from 100 to 112 lb. is satisfactory.

Varieties of Broom Millet.

The variety of broom millet generally grown in Queensland is White Italian. It is suited to the soils of either the alluvials or the slopes, although there are marked variations in the yields obtained on the two types of soils, because of the differences in their fertility and moisture-holding capacity.

Because of the necessity of producing brushes of high quality to obtain the best possible market price, it is advisable to plant the best seed obtainable. Where it is not convenient for a farmer to breed superior seed for his requirements, it is advisable for him to apply to the Broom Millet Board for his seed.

Stock Feed Value of Broom Millet.

The seeds removed from broom millet brushes are of low value for stock feed when the brushes are cut to produce green-coloured fibre, as the seeds are then in the dough stage. Where golden-coloured fibre is produced, however, the seeds are more mature when the brushes are cut and therefore contain a higher amount of nutrients.

Stock may be turned on to the stalks after the brushes are removed from the field if there is a scarcity of feed, as the leaves are of some feed value. It is considered, however, that it is better to cross-disk the stalks and leaves after the brushes are harvested and then plough all the material under in order to improve the condition of the soil.



Plate 65.

MOVING HEREFORD MOTHERS AND CALVES ON A DOWNS PROPERTY.



Thinning and Early Cultivation of Cotton.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

INVESTIGATIONS conducted over an extensive period have demonstrated the necessity of ample supplies of moisture for the cotton crop. It is advisable, therefore, to adopt every practice which will provide adequate soil moisture throughout the development of the cotton plant.

Early ploughing when applied in conjunction with the grassland-cotton rotation materially improves the possibilities of providing a good supply of subsoil moisture prior to planting and growers are increasingly adopting this procedure. Greater attention must be given, however, to conserving the moisture in the upper layers of the soil during the early growth of the cotton plants. Analyses of the yields obtained in October planted cotton on land in the first three years of cultivation after ploughing grassland at the Biloela Research Station have indicated that over an 18-year period good yields have invariably been obtained when good rains fell during October and early November. In other words, frequent penetrating rainfall during the first six weeks of the growth of the October planted cotton has promoted a good early growth which, under the conditions of ample moisture and the favourable balance of plant foods for cotton that exists in the newer cultivations after grassland, later set and developed a satisfactory crop. As the permeable condition of the surface soils in the newer cultivations allows the efficient penetration of the surplus moisture into the lower soils, a good supply of subsoil moisture was also stored for use by the heavily laden plants during stress conditions in summer. Clean cultivation was maintained throughout the growth of these crops and thinning was done when the plants were from 5 to 8 inches tall, both practices assisting in conserving as much as possible the moisture in the surface soils for the use of the rapidly growing plants.

The average yield obtained in these investigations irrespective of the time of planting, has been 750 lb. seed cotton per acre over the 18 year period which has included a wide range of climatic conditions. The results indicate, therefore, the wisdom of practising all methods that will provide and conserve all possible moisture for the use of the cotton plants during their early growth in order that they may develop a good crop of squares and bolls before the onset of the wet season.

Growers should, therefore, keep their cotton crops clean and thin them to suitable spacings, for both practices undoubtedly help to conserve the moisture in the surface soils.

In order to reduce the costs of both the thinning operations and the early cultivations, the suitability of the crop for cross harrowing must be carefully tested. Where the stand of seedlings is thick, and the surface of the field is relatively free from trash and pieces of roots, cross harrowing with a spike-tooth harrow will eliminate many bunches of the cotton seedlings without adversely affecting the stand. The removal of these excess plants prevents the development of spindly growth, which usually occurs when the stand of seedlings is too thick.

The results obtained in a cross harrowing experiment on old, weedy cultivations indicate that a considerable amount of weed growth can also be removed from the young cotton crop without destroying too many of the seedlings, provided a good stand has been obtained. By cross harrowing when the cotton seedlings were 2 inches tall and then cultivating between the rows with a riding cultivator equipped with tynes and guards to allow of the inner tynes being worked close to the row, weed growth was substantially reduced as compared with where only inter-row cultivation had been applied. Two and even three cross harrowings can be made if the original stand is good, without affecting the final stand—three harrowings before the plants were 5 inches tall, on the seedling stand obtained from a planting of 18 lb. of delinted seed per acre left slightly over an average of 2 plants per foot of row.



Plate 66.

A FIELD OF COTTON IN GOOD CONDITION FOR HOE-THINNING.—After the thinning is completed this field should be cultivated to establish a mulch around the plants. Note the light goose-necked hoe, which is the most suitable implement for hoe-thinning clean cotton.

Sufficient evidence is not available to indicate whether the stand of plants remaining after a crop has been cross harrowed two or three times can be left without further plants being removed by hoe thinning. Generally speaking, it appears advisable to err on the side of wide rather than too close spacing. It is suggested, therefore, that where, after the last cross harrowing, the stand is still fairly thick or irregularly spaced, so that there is some degree of crowding, the excess plants be thinned out with the hoe to leave the plant spacing mostly used in the district for the particular soil type. The final thinning out with the hoe of any excess plants left by the cross harrowings can be done over a considerable period without adversely affecting crop development. The cross harrowings thus reduce the amount of hoe thinning required per acre and also allow of this thinning being done over a longer period than normally, both of which are factors of great importance under present conditions.

Where either the stand of seedlings obtained is too thin, or the surface of the field is not suitable to allow of a cross harrowing being employed, it is strongly recommended that the plants be thinned out with the hoe to the most suitable spacing. Thinning in this instance should be commenced when the plants are about 5 inches tall and should be completed before they have exceeded 8 inches in height (Plate 66).

The most suitable spacing of the plants depends on the type of growth which may be expected to develop under the usual range of climatic conditions experienced during the growth of the cotton crop. Where large plants can normally be expected, it mostly appears advisable to space out farther than where smaller plants are usually produced. Generally speaking, however, spacings of less than 12 inches and more than 24 inches do not appear to be advisable. The following single-plant spacings in rows 4 to 4½ feet apart are recommended:—

Central District—12 to 18 inches on the fertile soils and 18 to 20 inches on the less fertile, harder soils;

Upper, Central, Coastal, and South Burnett—20 to 24 inches on the fertile soils and 18 to 20 inches on the less fertile soils;

Southern District—20 to 24 inches on all soils;

Western District—15 to 18 inches on all soils.

Early Cultivation.

Early cultivation of the cotton crop is particularly necessary under the climatic conditions of this State. In the districts south of Mackay, early planted cotton can be expected to produce better than cotton planted in late November or December. Most farmers in these areas plant their cotton following the first rains occurring after the first of October, and some farmers plant any time after mid-September, whenever suitable moisture is available. If the planting rains are rather light, planting is frequently done without a pre-planting harrowing in order to obtain the fullest benefit of the moisture present. Consequently, weed and grass seedlings may germinate at the same time as the cotton seedlings, and unless a cross harrowing is made before the latter appear a considerable amount of weed growth may occur in the row of cotton, especially if showery conditions follow planting. If the field is harrowed after the planting rain before the cotton is planted, and no further rain

occurs until the cotton plants are of some appreciable size, no difficulty should normally be experienced in maintaining a clean crop during the early stages of cultivation. Many growers give the early planted cotton crop little attention, however, for some time after planting it, particularly if further rains are experienced, to permit the planting of other crops. This is most inadvisable, as there is always the danger of prolonged showery conditions occurring when the cotton seedlings are small; and unless the field is kept clean prior to this the resultant weed and grass growth may either cause the abandonment of the crop or greatly increase the use of hand labour to clean it. It is highly advisable, therefore, to maintain a clean field of cotton, particularly in its younger stages of growth.

Emphasis has already been placed in this article on the merits of cross harrowing to thin out excess cotton seedlings, and to remove weed growth in the rows of young seedlings. Where it is found that cross



Plate 67.

COTTON SEEDLINGS IN A SUITABLE STAGE FOR FIRST INTER-ROW CULTIVATION.—Where the young cotton crop is not cross-harrowed, the first inter-row cultivation should be done when the cotton seedlings are 2 to 3 inches high.

harrowing cannot be practised, then the usual method of inter-row cultivation, for which the farmer is equipped, should be employed as soon as the rows of cotton are discernible (Plate 67). This operation will destroy any weed and grass seedlings germinating between the rows at the same time as the cotton. A similar cultivation should be given following each storm occurring during the early development of the cotton crop. This procedure will not only allow of efficient control of weed and grass growth between the rows being obtained, thereby making more of the moisture present in the soil available to the cotton plants, but the maintenance of the mulch on the surface of the soil will increase the penetration of each rain experienced. It is pointed out, however, that where a disc cultivator is used in cultivating young cotton the small ridge of soil and plants formed by the discs cutting the soil away from it should not be left with the sides exposed for a lengthy period of dry

weather. The ridge will dry out and set so hard under such conditions, particularly if a heavy storm preceded the cultivation operation, that the growth of the young plants will be retarded.

A considerable acreage of cotton is ploughed out each season through the crops becoming over-run with grass and weeds. Undoubtedly, much of this could be avoided if all growers maintained clean cultivation in the early stages of growth of their cotton crops. It is appreciated that, with the present labour position on many farms, it will be difficult to maintain a satisfactory state of cultivation by ordinary methods. It is strongly recommended, therefore, that cross harrowing be employed wherever possible, for a marked reduction in labour requirements to cultivate and thin the cotton crop can be effected thereby.

NORTH QUEENSLAND—A CANADIAN'S IMPRESSIONS.

"I was amazed at what I saw—the vastness of the country, the sparsity of the population, the tremendous possibilities of future development which are to be seen on every hand." That is how Northern Queensland impressed the High Commissioner for Canada (Mr. Justice Davies), who returned to Canberra recently from a visit to the North. In the course of three weeks he managed to visit Cairns, the Atherton Tableland, Townsville, Charters Towers, Mackay, and Rockhampton.

"I expected to see tropical production," he said, "but to my astonishment I found the country was not only capable of producing everything that can be produced anywhere in the tropical world, but was also capable of the production of agricultural commodities usually associated with a temperate zone. I doubt whether one can find any place in the world where there is this combination to the same extent.

"On top of that, they have up there what I believe to be the best hardwoods in the world, a capacity for great mineral production, big ranches (or cattle stations, as they are called in Australia), and, over all, a climate that for at least ten months in the year is ideal. They have the benefits of ocean carriage and rail carriage, and there are the possibilities of great, efficient industries. I came away with the belief that there is hardly anything that cannot be produced there. So far as production is concerned, the country I passed through should be capable of sustaining a population as large as the present population of the whole of Australia. Its development, however, will depend upon markets for the commodities that can be produced there in such great quantities. I was greatly interested in the sugar cane plantations and mills. I had never before seen a sugar mill. I was impressed by the tidiness and neatness of the farms and the evident efficiency of the whole industry.

"From the standpoint of scenic beauty, I saw things like Tully Falls on the Atherton Tableland which are equal to anything I have seen anywhere; and in the Barrier Reef islands they have an asset which, to my mind, is unequalled. I know a bit about California and Florida, but they have nothing to approach the things I saw. In my lifetime many Canadians, seeking a warmer climate, have gone to California and Florida. It seems to me most unfortunate that these people, numbering hundreds of thousands, had not been acquainted with the possibilities of Northern Queensland."

The High Commissioner for Canada came back from the North convinced that there are great opportunities for increased trade between Canada and Queensland. Incidentally, he paid a high tribute to the newspapers of North Queensland. "They are a credit to the communities in which they are published," he said. "I was surprised to find such 'up-and-coming' dailies in so many places with a complete coverage of the world's news."



Pineapple Growing in Queensland.

H. BARNES, Director of Fruit Culture.

THE many cultivated varieties of pineapple have been developed from a type native to South America. In Queensland there are only three varieties of commercial importance. These are the smooth-leaf, which is used for both canning and dessert purposes, and two rough-leaved varieties—the common rough and the Ripley Queen—both of which are consumed mainly as fresh fruit. The typical Ripley Queen is larger than the common rough and has larger fruitlets. It tends to be ovate in shape and has a crimson tinge in the leaves, while the common rough has a cylindrical fruit and purple leaves. In the field it is often difficult to distinguish the two varieties.

Suitable Districts.

The pineapple flourishes in the coastal strip from the southern border to the far north, but within this area situations subject to frost and cold westerly winds are unfavourable. The direction of slope of the land is important in southern Queensland: a few degrees of adverse slope have the same effect as several degrees of latitude. A fairly high and regular rainfall is desirable, but with proper cultural treatment, such as the use of paper mulch for the purpose of conserving soil moisture, the crop can be grown in districts of moderate rainfall. Excessive rainfall tends to the production of a soft, watery fruit and also adversely affects soil conditions for the plants.

Soils.

Successful plantations are found on many types of soil, including sandy loams and granitic, basaltic, schistose, and alluvial loams. One feature is common to all, however—a loose, friable texture and good drainage. There should be a fair depth of topsoil and the subsoil should be friable and open. Adequate drainage is of prime importance. A high humus content is also desirable and cultural practices which maintain the humus content should be adopted.

Acidity of the soil is also very important. A good pineapple soil is strongly acid, with a pH of 4.5 to 5 (pH is the soil chemist's measure of soil acidity: a neutral soil has a pH value of 7 and an extremely acid soil a pH of about 4). Lime should under no circumstances be applied to pineapple soils. Should the soil not be sufficiently acid it should be treated with sulphur at a rate recommended by a soils chemist. High soil acidity is necessary to render iron, which is a very important

element in the pineapple, available to the plant. In a few soils the presence of appreciable quantities of manganese prevents response to sulphur applications, and in these cases the crop should be regularly sprayed with a very weak solution of sulphate of iron.

The ideal soil is, therefore, a loose, friable, deep, well-drained yet moisture-retaining, soil overlying a subsoil of similar nature. A high humus content and a strongly acid reaction are essential. Probably the best soil type is a coarse sandy loam.

Preparation of the Land.

On virgin, timbered land the timber is felled, stumped, and the roots run to 18 inches, and burned off. Subsequently the land is broken up and if possible sub-soiled to 18 inches. Fierce fires in clearing are not desirable.

Land preparation should be completed well in advance of planting so as to consolidate the soil and also accumulate a good moisture content to give the young plants a start. When sulphuring is necessary this is done prior to planting. The ground sulphur is evenly broadcast over the prepared surface and very lightly harrowed under.

The most suitable layout of the rows needs to be carefully considered. Drainage, prevention of erosion, and ease of working, are important. Other factors being equal, a north-south alignment is best, but should not overrule drainage or prevention of erosion. Short rows make working and harvesting easier. The headlands or roadways should be sufficiently wide for a cart or truck to pass, but should not exceed 10 per cent. of the area.

The rows are best run up and down hill, and should lead to cross drains, which in turn empty into main drains running parallel with the rows. Naturally, the steeper the slope the shorter the rows and the more cross drains. This layout will prevent erosion, which, contrary to general belief, rows placed across the slope will not do.

The question of replanting pineapple land is of major importance. It has been abundantly demonstrated in Hawaii that, when properly managed, land should increase in fertility with each cycle of pineapples. Briefly, the Hawaiian practice is to limit the cropping cycle to three crops. These secured, the whole of the stand is shredded up and subsequently ploughed into the soil. It is estimated that 150 tons per acre of organic matter is thus returned to the soil. This great amount could never be supplied by green manuring. The humus content of the soil is thus built up with the years and, furthermore, all the fertilizer which grew the stand except that which is removed in the fruit is returned to the soil in readily available form. In some districts in Queensland this is being done by heavy rotary cultivators at contract rates.

In tropical countries the heat and moisture rapidly oxidise the humus when a bare soil is exposed to the sun. This is aggravated in light sandy soils. With a combination of close planting and the returning of the old stand to the soil to rot, land should continue in fertility for an indefinite period.

Planting Material and Planting.

(a) Planting Material.

The pineapple normally perpetuates itself by means of shoots from the stem which in their turn produce fruit and more shoots. These are called "suckers." There are other growths from the fruit stalk called variously "slips," "nibs," &c. Also there is the tuft of leaves above the fruit called the "top." All these three forms of growth can be used to plant a fresh plantation.

Planting material should always be taken from healthy plants in full vigour; that from first-crop plants is best. A grower who selects his planting material for each new planting from his best first-crop plants exhibiting early maturity, free suckering, low stature, and large well-shaped fruit will finally have a stock returning him increasing tonnage per acre, and by producing it in shorter time will increase his profits by reducing costs of production. Whilst almost any sort of sucker, slip, or top may under favourable conditions grow after a fashion, material taken from old, neglected, and worn-out plants will never be fully satisfactory. That from wilted parents will always have a tendency to wilt.

Suckers are robust, stand up best to adverse conditions, and produce their first crop earliest. Slips and tops take longer to bear, but produce a better first crop. Medium-sized suckers are better than large ones. These latter often flower before they are properly established, and the resulting fruit is worthless.

Slips from Smooth-leaves make excellent plants; those from Roughs and Ripleys are usually too small for field planting. The small pinelet at the base of slips is always broken off. The best slips are those which come singly from the lower part of the fruit stalk as distinct from those which come in a cluster around the base of the fruit. This is called the "collar of slips" type and is very undesirable to propagate for several reasons, one of which is that such slips if planted rarely produce suckers for a ratoon crop.

Tops also make superior plants when conditions are good to give them a start. Tops taken from early-maturing, large, well-shaped factory fruit give a good opportunity for plant selection.

Very large suckers near to flowering are often used when other material is scarce. These are best stripped, dried and planted horizontally like cane sets in shallow furrows and covered with 1 inch of soil. Clusters of plants will shortly appear above ground, and some may have to be thinned out.

(b) Storing Suckers, Slips, and Tops.

If it is necessary to store material before planting it will keep perfectly for several months if stacked in a single layer, butts-up in the shade in the open. It should never be set in a nursery bed.

When ready to plant it is very important to strip off the base leaves and dry the butts for several days in the sun. If the former is not done the plants will be slow to start growing, and are liable to "tangle root." If not dried, base rot is likely to destroy the young plant in the soil.

The best practice is not to cut back the leaves very hard; in fact, the leaves of small suckers as well as slips and tops are better left intact.

(c) Planting.

The pineapple is very shallow rooted and should be shallow planted. About 4 inches for suckers and a little less for slips and tops is about correct. Except on land likely to be unduly wet at times, when low ridges can be made, plants should be set out on the ground level. To prevent competition between plants of different sizes to the detriment of the smaller, it is always wise to grade suckers into larger and smaller. The best way to plant is to peg out the land at the required distances and use a line stretched between top and bottom pegs. For well-prepared soil a dibbler in the left hand makes the hole, and the sucker grasped with the right is screwed in. It expedites work if the material is roughly laid out first.

(d) Spacing.

Few operations have been so revolutionised in modern pineapple growing as the spacing of the plants. Formerly it was the practice, developed in the days when stable manure was plentiful, to set the plants out in double or single rows about 9 feet apart. Without stable manure the rows seldom or never closed up, and a great deal of land was wasted, not to speak of the labour in clearing and cultivating unused land. The soil being so exposed to the sun was spoilt for replanting. Furthermore, it has been conclusively proved that pineapple plants as individuals grow better when set close together.

The plant being so shallow-rooted requires the surface layers of the soil to be cool and moist, and one way to achieve this is to set the plants sufficiently close to shade the soil around them, allowing each plant, however, sufficient space to spread its leaves and receive the maximum sunlight. Tests have shown that as much moisture is evaporated from an unshaded soil as would be taken up by pineapples growing thereon.

The double row system has proved best for smooth-leaves. The normal practice is to set the double rows 2 feet apart, with the plants spaced 1 foot in the rows. A 4-foot passage way is left for harvesting and cultivation. This has proved the most satisfactory for the warmer, well-drained light soils. For heavier and colder soils, and for districts of high rainfall, the plants should be spaced 14 inches to 18 inches in the rows, so as to allow more sunlight among the plants, the other distances remaining the same.

For replanting on old land of reduced fertility the rows can still remain at 2 feet apart and the plants 12 inches in the rows, but the passage-way should be narrowed to 3 feet 6 inches.

At planting the line is stretched between the pegs set at 6 feet or 5 feet 6 inches intervals, as the case may be, and the plants set at the correct intervals 1 foot on each side of the line.

Roughs and Ripleys, on account of their prickly leaves, are more conveniently grown in single rows set 4 feet apart.

The following table gives the number of plants per acre at the different spacings:—

Double Rows—Plants 12 inches apart.			
Spacing of centres.	Plants per acre.	Chains to acre.	Plants per chain.
ft. in.			
5 6	15,840	120	132
6	14,520	110	132
9	9,680	73.3	132
Double Rows—Plants 14 inches apart.			
5 6	13,440	120	112
6	12,446	110	112
9	8,200	73.3	112
Single Rows—Plants 12 inches apart.			
4	10,890	165	66
9	4,840	73.3	66
Single Rows—Plants 14 inches apart.			
4	9,240	165	56
9	4,100	73.3	56

(e) Time to Plant.

The suitability of certain months of the year for planting is governed by the warmth and moisture normally occurring therein. The pineapple being a tropical plant should not be planted until the winter is past, neither as a general rule should it be planted late in the autumn. Generally, early spring is the best, since the maximum period of warm weather will follow in which to make growth. September and October are good months in the southern part of the State.

However, the availability of planting material will exert some influence. Winter tops for spring planting are excellent, if large enough. Summer tops for autumn planting often develop base or top rot, and care is necessary to thoroughly dry them before planting, but otherwise they are usually better developed than winter tops. Sucker growth during the winter months is often backward; during the summer it is more plentiful. Slips, probably the best of all material, are normally scarce on the winter crop, but more plentiful during the summer. They are, therefore, more available for autumn planting than spring, but properly stored can be held until the latter time.

Cultivation and Plantation Management.

The shallow-rooting system of the pineapple is seriously injured by deep cultivation near the plants. Horse-drawn implements and rotary hoes should not be used. Close planting renders them unnecessary, except perhaps when a flush of weed growth during the first couple of months after planting may excuse the use of a light and narrow strawberry cultivator down the centres. The torpedo-shaped Dutch hoe in capable hands is the best tool, but used carelessly can easily damage plants, and for this reason many growers favour the chipping hoe when paid labour is employed.

The tendency should be to work the soil up to the plants as they become older rather than away from them, but deliberate hilling-up is only advisable under special circumstances. The exceptions are generally old-style plantations, where incorrect early treatment has resulted in the plants becoming "leggy." In this case it is often advantageous to shovel soil in amongst the plants with the object of promoting fresh root growths from above-ground nodes.

Paper mulch is of great value on light sandy soils and in districts of low rainfall and porous soil. It pays for itself by reducing weeding costs and producing a greater weight of fruit per acre. It is essential to lay it on well-prepared soil worked to a fine even tilth, and in moist condition. Laid on lumpy, dry soil it is not satisfactory.

Acetylene gas can be used to force flowering in pineapples. Compressed acetylene gas may be used, but there is a simpler method which consists of rapidly stirring a handful of calcium carbide in a kerosene-tinful of water and applying the solution by means of a knapsack spray with a trigger release and a $\frac{3}{16}$ inch tube 2 feet long substituted for the nozzle.

Fertilizing.*

For the modern system of close planting a new type of fertilizer and a different method of application has been evolved.

The pineapple is a humus-loving plant, and if frequent mulchings of well-rotted stable manure, &c., can be given it will stand up to rough treatment otherwise fatal to it. The effects of mulching will be to keep the adjoining soil cool and moist, thus fostering a stronger and healthy root system, to supply readily available plant foods, and what to this specialised plant is most important, to cater for the ancestral habits developed by its forebears in constantly forming new roots into the fresh layers of leaf debris. Stable manure, however is not an all-sufficient fertilizer, and, anyhow, is no longer obtainable in quantity, and other methods are necessary. One already described is close planting to supply the mulching effect. A shorter cycle of cropping will minimise the tendency to become "leggy," while a potash-rich fertilizer will reduce this tendency.

Fertilizers are applied to supply the three elements, nitrogen, phosphoric acid, and potash. Formerly it was the practice to supply the nitrogen and phosphoric acid in the form of blood, bone, and meat-works, in accordance with the accepted practice with many other crops. These, however, must be incorporated in the soil, and it is not possible effectively to do this in an established plantation.

Furthermore, when the feeble root system of the pineapple is weakened by various agencies the plant may be actually starved through its inability to obtain what is in the soil. The modern practice is to apply the elements in water-soluble form, and the formula 10-6-10 is employed. This consists of sulphate of ammonia, superphosphate, and sulphate of potash. It is thrown into the lowest leaves at ground level, and is dissolved by degrees by rain and dew, and is taken up by the roots including those in the lower-leaf bases. In the first application to newly planted tops, slips, or suckers especial care must be taken to place it low down otherwise the tender centre leaves will be damaged.

The first and very important application is made about one month after planting, and consists of 30 lb. to each 1,000 plants. Subsequent applications are at about 40 lb. to 50 lb. per 1,000. In fertilizing full advantage should be taken of the active growing period, and applications are advised in September, November, January, and March. There are

* Under wartime fertilizer rationing the quantities and formulae of fertilizers available to pineapple growers vary from time to time and it may not be possible to adopt the recommendations made in this section.

times when a slight variation may be made such as a light application of sulphate of ammonia alone, just after picking the crop in order to hasten the growth of backward suckers.

Actually the colour and type of growth is indicative of their fertilizer needs, and with experience will be taken as the guide. The colour of the leaves indicates the nutritional processes going on. The deep blue-green of young plants indicates the formation of proteins, and is what should be encouraged. Nitrogen is particularly needed at this stage. As flowering approaches the formation of carbohydrates is necessary, and the process is indicated by the change to an olive-green. When a yellowing of the tips at this stage occurs in plants previously a good colour it denotes the formation of carbohydrates is not sufficient for the needs of the developing fruit, and signifies that potash is lacking.

Improvement of Type.

Under suitable conditions the pineapple produces a few seeds, and it is by crossing different sorts and planting the resulting seeds that new varieties are produced. However, it is a plant which has developed the vegetative method of reproduction to such an extent that offshoots are the normal means of extending plantations.

The plant developed from a seed will blend the characters of both parents, but the plant developed from a sucker, cutting, bud, &c., is actually a part of the original plant, and normally reproduces its characters completely. It sometimes happens, however, that some irregularity occurs in the bud, and the result is a sport or variation. Many of the varieties of bananas, pineapples, and other plants have originated in this way. The variation may be towards improvement or it may be retrogressive.

Occasions may therefore arise when a scion may be either superior or inferior to the stock. Unconscious selection by primitive cultivators over ages of time has resulted in many of the cultivated fruits and plants grown to-day. The pineapple grower is wise, therefore, to cull out all bad types of plants or fruit, so that there will be no risk of their further propagation, and carefully multiply any plant which appears to have superior characteristics. Quite apart from only using planting material from healthy, vigorous plantations, suckers, slips, and tops for extension of areas should be taken only from good average type plants showing desirable characteristics. The removal of tops from factory fruit of eighteen and larger, and their utilization as planting material, offers an expeditious way of selection for size of fruit. Other aspects of plant selection, such as early maturity, low stature, free suckering, disease resistance, &c., need to be considered.

Amongst the bad types of pineapples are Bottle Tops, Long Toms, Tree Pines, Collars of Slips, Albinos, Cripples, and Narrow Leafs.

Diseases.

The chief troubles affecting the fruit and the plant in Queensland are:—Wilt, Top Rot, Base Rot, Black Heart, Black Speck, and Water Blister. Their incidence is largely bound up with cultural operations, and it is fortunate that they can be greatly minimised if not entirely prevented by attention to proper cultural methods, and to packing shed hygiene.

VEGETABLE PRODUCTION

Vegetable Growing in North Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

PART 6.

Summer Spinach.

THIS is a strictly tropical vegetable that thrives in Northern coastal areas during the hottest part of the year when very few other greens can be produced. It is closely related to the decorative garden plant known by the name *Amaranthus*, and also to the common garden weed similarly known. The seed is glossy black in colour and very fine. Its small size makes it difficult to sow sufficiently thinly to secure good seedlings. The difficulty may be overcome, however, by stirring the seed in a can of water and watering it on to the seed bed through a medium-fine rose. The seedlings are fit to transplant in two to three weeks after sowing and should be set in the field in rows 18 to 24 inches apart, with 6 to 9 inches between the plants. In about 15 to 20 days from transplanting the plants should have reached a height of 10 to 12 inches, when they are fit for harvest. The whole plants are pulled and, after having the roots washed, are tied into bundles for marketing.

Beet.

Soil for this crop should be well supplied with organic matter and available plant food and should be in good physical condition. The beet is very sensitive to soil acidity, so much so that it will not grow successfully in soils even moderately acid. If the soil is not naturally almost neutral in reaction lime must be added in sufficient quantity to produce such a condition. Soils that tend to form a crust are not suitable for beet growing owing to the weakness of the young seedlings and their inability to break through the crust and produce a good stand.

The usual method of sowing is direct to drills in the field, the drills being spaced to suit the cultivating equipment. As soon as the plants are 3-4 inches high they should be thinned to about 3 to 4 inches apart. If desired, the thinnings may be used for transplants to extend the area under crop. This is not usually payable on large scale beet areas, however, owing to the amount of labour involved in transplanting.

The crop attains its best colour, texture and quality under reasonably cool conditions, therefore its growth should be undertaken during the cooler months of the year. Varieties that give good results in the North are Egyptian Turnip Rooted, Crimson Globe, Detroit Dark Red and Obelisk.

The ideal beet should be uniformly dark red right through the root; pale rings indicate poor type or unsatisfactory growing conditions.

Chard.

This is also known as silver beet or spinach beet. It is grown for the green spinach top. This plant is a more suitable green for North Queensland than the true spinach, which is less adaptable to the range of climatic conditions. Soil and cultural requirements are the same as for table beet. The best variety is Fordhook Giant.

Spinach.

This is essentially a cool weather crop and can only be grown successfully in the highland areas of the North during the winter months. It will not thrive in coastal regions. It is the vegetable popularly reputed of high vitamin content and should not be confused with the spinach beet or silver beet mentioned above.

Similar soils and cultural methods as for the preceding crop are required. Top dressing with nitrogenous fertilizers is recommended to produce the succulent green leaves.

Two types or strains of spinach are available, namely the round seeded and the prickly seeded, the latter of which is usually regarded as the hardier.

Rhubarb.

This also is a cool weather plant and only really thrives in the highlands of the North. In coastal areas it may be grown as an annual in home gardens during the winter months, but a product of commercial quality cannot be expected, therefore its commercial production should not be attempted.

Soil for this crop should be well drained, deep, rich, and of moderate acidity. Heavy dressings of stable manure will assist in the production of large leaf stalks, which is the aim in growing this crop.

A complete fertilizer with a meatworks manure base, in quantities up to half a ton per acre, may be substituted for farmyard manure.

Good varieties are Tops Winter, Ruby Red and Emu Plains Red. The rhubarb plantation should be established with crowns so that a stand of plants true to type may be secured. Seedlings are very variable and cannot be depended upon for the production of good types.

Shallot.

This crop may be marketed either as a salad green or as dry bulbs. The chief demand in the North is for the green vegetable. The main crop should, therefore, be grown for this purpose. The usual and most satisfactory method of propagation is from bulbils or cloves. Each dry bulb will be found to be composed of a number of these cloves and for planting should be divided into its components. These should be set in the field about 9 to 12 inches apart in rows, and planted at least 3 inches deep in rich, well prepared land. Deep planting is recommended so that long, well-blanching and succulent tops may be obtained. In good soil and under good cultural conditions multiplication of the tops is rapid. The whole plant is pulled before the tops begin to yellow.

At this stage the bulbs are still soft and only beginning to develop, the earthed portion of the stalk is white, and the aerial portion quite green. The whole plant is sweet and mild in flavour.

When growing shallots for the dry bulbs, shallow planting must be practised and the soil be gradually drawn away from the plants during their growing period, until, as they approach maturity, they are practically sitting on top of the earth. This treatment encourages the filling out and hardening of the bulbs. Under this method of growing the bulbs are not harvested until the tops begin to dry, indicating full maturity. Such bulbs are used as a mild substitute for onions.

Sweet Corn.

This crop will withstand neither excessive heat nor frost. In North Queensland its cultivation may, therefore, be undertaken in the coastal regions during the cooler months of the year and on the highlands during the summer months. As corn loses its value as a vegetable within a short time of harvesting it should, however, be grown only in close proximity to the market.

Sweet corn requires similar soil and growing conditions to ordinary field maize. The growing period is somewhat shorter and the height of plant is less. Planting distance may, therefore, be closer than for ordinary maize, but overcrowding reduces yield and should be avoided. Ample soil moisture is necessary throughout the growth of the crop so that even and rapid growth may be obtained.

The corn is ready for harvest as soon as the grains become plump and while they are still in the "milk" stage. This stage practically coincides with the browning off of the silks, but some experience is necessary to enable the grower to judge the exact stage for harvesting. Corn in which the grains are becoming mealy is over mature and unfit for market.

Golden Cross Bantam is outstandingly the best variety, but Golden Bantam and Country Gentleman also give good results.

Corn ear worm is usually very prevalent in this crop, practically every ear being attacked in some seasons. However, the corn is usually harvested before the caterpillar has penetrated any distance into the cob, so that wastage is seldom very great.

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PLANT PROTECTION

The Control of Locusts and Grasshoppers.

J. A. WEDDELL, Research Officer.

OUTBREAKS of locusts and grasshoppers occur at intervals in most parts of Queensland. The insects commonly seen in plague proportions may belong to any one of the following five species:—the Australian plague locust, the yellow-winged locust, the spur-throated locust, the wingless grasshopper, and the migratory locust.

The *Australian plague locust** (Plate 68) is most injurious in sub-coastal agricultural areas and is responsible for damage to pastures, cereals, and fodder crops. It is about one and a-half inches long and can be distinguished from other pest species by the black tip on each hind wing. There are usually three generations annually. The *yellow-winged locust*† (Plate 69) is normally found in pastoral areas with an annual rainfall

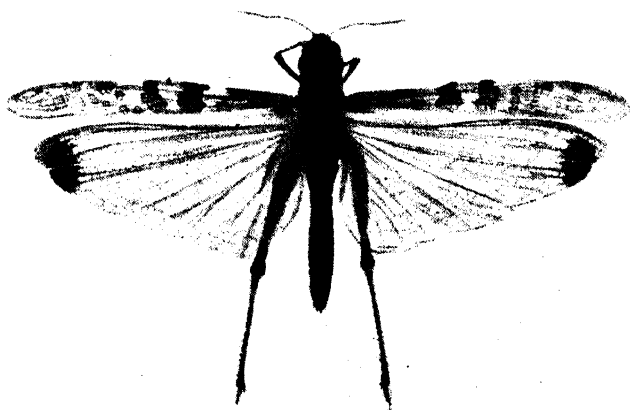


Plate 68.

THE AUSTRALIAN PLAGUE LOCUST.—Note the black-tipped hind wings.

of less than thirty inches, but it occasionally invades the wetter coastal districts of central and northern Queensland. It is about two inches long and the hind wing is typically yellow with a centrally placed dark band and a clear tip. In flight, the adults make a distinct clicking noise. Two generations occur annually. When the insects are swarming, pastures, sorghum, maize, and sugar cane may be destroyed. The *spur-throated locust*‡ is mainly a subtropical and tropical insect which is two

* *Chortoicetes terminifera* Walk.

† *Gastrimargus musicus* Sjost.

‡ *Austacris guttulosa* Walk.

to three inches in length with a large spur under the neck. It swarms in subcoastal areas causing damage to pastures, fodder crops, and cotton. Some native trees may also be defoliated during the autumn and winter months. The *wingless grasshopper** occurs in southern Queensland within 200 miles of the coast. It is less than three-quarters of an inch in length and the majority of the insects in any swarm have no wings though odd winged forms may occasionally be seen. There is only one generation each year, but migrations from grasslands to tobacco crops and market gardens sometimes cause considerable damage. The *migratory locust*† is rather more than two inches long and it occurs in coastal areas. Swarms occasionally form in the tropics and these may migrate long distances. Damage to sugar cane has been reported.



Plate 69

THE YELLOW WINGED LOCUST —Note the yellow base, the dark central band and the clear tip of the hind wing

Life History.

For all the species mentioned above, the life history, in so far as it concerns direct control measures, is fundamentally the same. The adult female lays eggs in capsules in the ground. After a period, the duration of which depends on the species concerned and the time of the year, the young hoppers emerge from the eggs and feed for some weeks before the adult stage is reached. Occasionally, one or other of the plague species swarms, and during this phase innumerable adults lay eggs in restricted areas, thus establishing compact egg-beds. The hopper swarms from these egg-beds are very dense and they move slowly at first, but feed over much wider areas as they grow. Once the adult stage is reached, their swarms may migrate over large distances.

* *Phaulacridum vittatum* Sjöstr

† *Locusta migratoria* L.

Locust outbreaks occur at comparatively long intervals and they may last for periods ranging from a few months to three years. These outbreaks are always associated with the phenomenon of swarming which marks the beginning of migratory tendencies in the species and continues during the outbreaks. Swarming usually takes place when climatic factors are continuously favourable for the insect and ceases when populations become small owing to unfavourable weather; the interactions of these factors are very complex and their precise effect on all pest species is not known with any certainty. Egg parasites*, however, often end an outbreak much sooner than would otherwise be expected. Most of these egg parasites are small black wasps (Plate 70) which penetrate the egg capsules in the ground and lay their own eggs within those of the host. The parasites then develop at the expense of the locust eggs. If the parasitic wasps are numerous, they are readily seen working over the egg-beds, particularly when these are first established and again when hopper emergence begins.

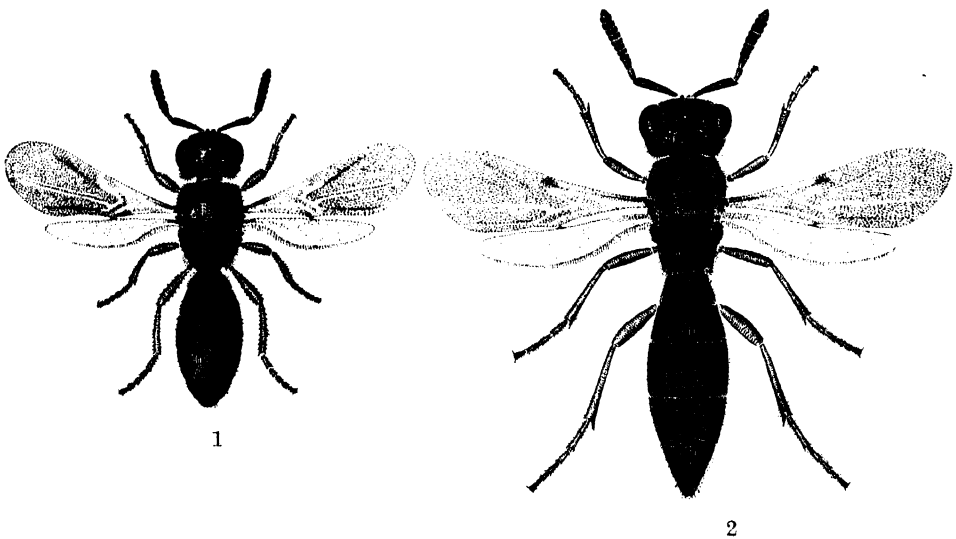


Plate 70.

WASP PARASITES OF LOCUST EGGS.—Fig. 1—*Scelio fulgidus* Crawf., from eggs of the Australian plague locust, $\times 10$; fig. 2—*Scelio bipartitus* Kieff. from eggs of the yellow winged locust, $\times 10$.

Control Measures.

Any necessary control measures must be carried out when the swarms are in the young hopper stage. Prompt treatment may be ensured by noting and marking the location of the egg-beds when laying is in progress and later examining these areas regularly for hopper emergence. An effective method of controlling hopper swarms involves the use of a poison bran bait. The bait is easy to mix and apply; it is effective against the insect and not injurious to stock when properly used; it is economical, for no special apparatus or equipment is required; and it does not interfere with the activities of the valuable egg parasites.

* The more important species are *Scelio fulgidus* Crawf. on the Australian plague locust and *Scelio bipartitus* Kieff. on the yellow-winged locust.

The bait consists of $\frac{1}{2}$ lb. arsenic pentoxide, 1 to $1\frac{1}{2}$ quarts of molasses, $2\frac{1}{2}$ gallons water, and 24 lb. bran. The arsenic pentoxide and molasses should each be dissolved in about one pint of boiling water and then added to cold water, bringing up the total to $2\frac{1}{2}$ gallons. This poison solution should then be stirred into the bran which is thoroughly mixed until the whole is a moist but loose crumbly mash. The limits of the hopper swarm should be roughly determined and a strip of 30 feet allowed in front of the swarm. The whole area occupied by the swarm, together with the adjacent strip, should then be baited by broadcasting the poisoned bran thinly and uniformly in a finely divided state, as in the hand-sowing of grain. The quantity of bait prepared from 36 lb. of dry bran is sufficient to cover one acre of ground. During cool weather, the application of the bait should be made during the warm part of the day, preferably between the hours of 9.0 a.m. and 3.0 p.m. In the summer months when the temperatures are high, the hoppers may be inactive during the middle of the day. Under these conditions, it is necessary to distribute the bait over the swarms when they are active during the morning and the afternoon and to discontinue the work for some two or three hours in the hottest part of the day. A supply of the bait, sufficient for the day's requirements, may be prepared in the early morning so as to enable the best use being made of suitable hours for baiting. Alternatively, where groups of men are working together, the several sections of the work may be divided among them by forming a mixing and loading gang, a scouting gang looking for swarms, and a bait-scattering gang. The bait should be kept in a moist loose state during transport to the hopper-infested areas. The effects of baiting are evident about twenty-four hours after treatment.

It is essential that the swarms be baited in the hopper stage, preferably within the first three weeks after emergence from the egg-beds. Even so, a few days should elapse after the commencement of hatching, so that hatching will be almost complete when treatment is applied to the hoppers from any particular egg-bed. Hoppers more than three weeks old will feed on and be killed by the bait but, owing to the spread of the insects from the egg-beds, wider areas will then need to be baited. The young hoppers normally have a distinctive swarming habit and they remain congregated in compact bands for the first week or two after emergence, moving during that time only short distances from the egg-beds. Thus a large hopper population that might later spread and infest a considerable area can easily be controlled before dispersal takes place by dealing with the compact swarms of young hoppers.

The poison should be handled with discretion; the hands may be protected by coating them with vaseline, petroleum jelly or axle grease, and, after mixing or spreading the bait, they should be thoroughly scrubbed. Domestic animals should not be allowed access to bulk supplies of the bait or to mixing sites. Although no absolute guarantee of safety can be given owing to the poisonous nature of the arsenic pentoxide, the danger to stock grazing over *properly baited* ground is practically negligible owing to the small amount of the poison in, and the thin distribution of, the bait.

Downy Mildew and Septoria Leaf Spot of Lettuce.

F. W. BLACKFORD, Assistant Research Officer.

DOWNY mildew and septoria leaf spot are two of the diseases which may attack lettuce crops in this State and their symptoms and the measures which may be taken to combat them are discussed briefly in this article.

DOWNY MILDEW.

Downy mildew can quite often be found in lettuce plantings in Queensland although it only occasionally causes serious damage to the crop. The occurrence of heavy losses is dependent on the prevalence of weather conditions which are favourable to the spread of the disease. It is most frequently encountered in the very young plants in the seed-bed, but well-developed lettuce may also be affected. In the latter case, the lower leaves—which are shaded and thus normally wet for considerable periods after watering, rain, or heavy dew—are the portions of the plant to be attacked. Little loss, however, results from such infection of nearly mature plants, because the mildewed leaves would be removed in any case when the heads are cut for marketing. The disease is most prevalent during the winter and spring months, cool, moist conditions in overcrowded or shaded seed-beds being conducive to a very rapid spread of this mildew.

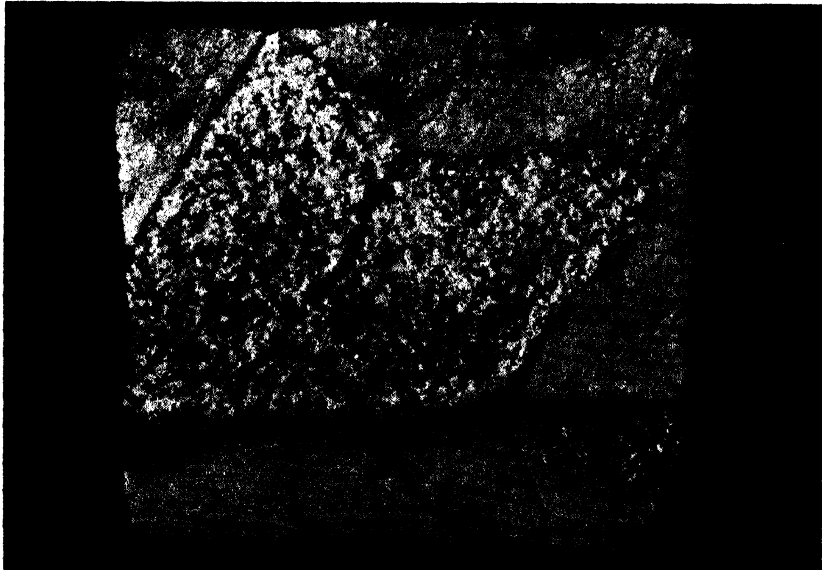


Plate 71.

DOWNY MILDEW OF LETTUCE.—Underside of leaf showing mildew.

The first symptoms of downy mildew to appear are light-green to yellowish spots on the leaves. The white, downy growth of the causal fungus* may be found on the under surface of these spots (Plate 71) if conditions are at all moist. In severe cases, the whole plant is dwarfed by the infection, and becomes yellow in colour. Affected tissues may turn brown, and, if conditions continue to be wet, a soft, slimy rot ensues.

* *Bremia lactucae*.

Control.

The control of this disease can be materially assisted by sowing the seed thinly and by thinning out the plants as early as possible to permit free circulation of the air and quick drying of the leaves. Another important point is that if the plants are kept healthy during the early stages of growth very little trouble should be experienced later on. If the disease has appeared in previous crops, it is advisable to make one or two applications of a copper spray such as Bordeaux mixture (3-2-40) or home-made cuprous oxide mixture (3-40) in order to minimise the chance of the mildew becoming well established in the new crop. The initial application should be made shortly after the first true leaves have formed and a further one about a week later. If the seedlings are to be transplanted, spraying should be completed three or four days prior to transplanting in order to avoid a double check being administered to the plants.

SEPTORIA LEAF SPOT.

Septoria leaf spot is usually found attacking the lower leaves on which irregularly-shaped, light-brown spots develop as a result of the presence of the fungus (Plate 72). Studding these spots are small, black bodies measuring about a quarter of the size of a pin's head; these are the fruiting bodies of the causal fungus.* They are flask-shaped and, under moist conditions, a curly thread of spores is extruded through a very small hole in the neck of the flask.

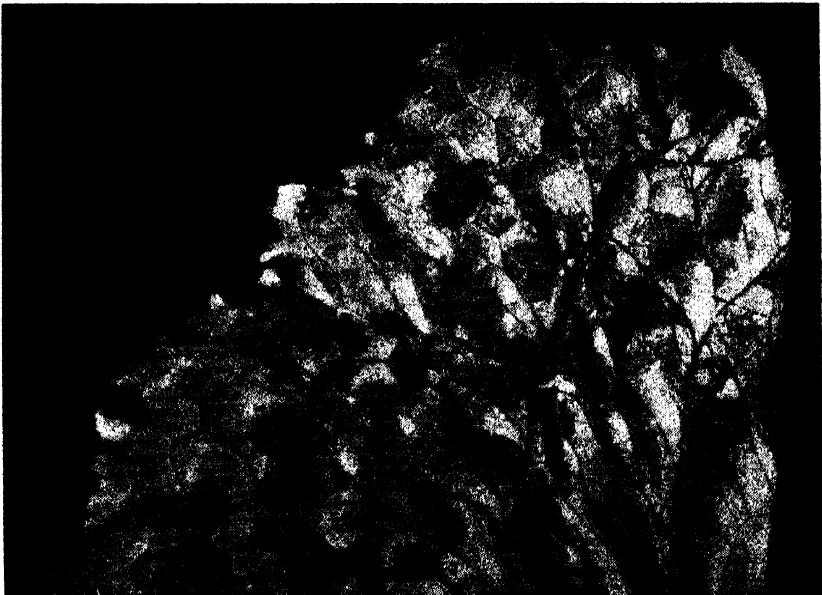


Plate 72.

SEPTORIA LEAF SPOT OF LETTUCE.—Portion of leaf showing spots and fruiting bodies.

Very few plantings of lettuce in Queensland are entirely free from this disease and a close examination of even the healthiest lettuce planting usually reveals its presence on the lower leaves of some of the

* *Septoria lactucae*.

plants. As these affected leaves frequently die before the lettuce is picked, or are stripped before packing, the disease usually is of no consequence. On occasions, however, the trouble is found on leaves which form a part of the marketable head or is well established on half-developed plants, but it is considered that such plants have suffered some check in their growth and that this check has permitted the fungus to attack leaves further up the stalk than is normally the case.

Control.

Where this disease has developed extensively, growers should investigate the possible causes of a check to the growth of the plants. Adverse soil conditions, or insufficient nitrogen or water, or excessive shading in the cooler months of the year, permit the disease to increase in severity, and it can best be dealt with by eliminating these adverse factors.

INFORMATIONAL AND ADVISORY SERVICES.

Information and advice on matters relating to primary production may be obtained from the Department of Agriculture and Stock, William Street, Brisbane, B. 7, or from appropriate officers in country centres. The following list shows where Departmental advisory officers are stationed:—

GENERAL AGRICULTURAL CROPS AND PASTURES: Brisbane (Tel. B 1541); Toowoomba; Chinchilla; Warwick; Laidley; Boonah; Kingaroy; Bundaberg (Court House); Monto; Rockhampton (cnr. Bolsover and Fitzroy Streets); Mackay (Court House); Ayr; Home Hill; South Johnstone (Bureau of Tropical Agriculture); Atherton; and Mareeba.

COTTON: Brisbane (Tel. B 1541); Dalby; Kingaroy; Gayndah (Court House); Monto; Biloela (Cotton Research Station); Home Hill; Ayr. All advisors on general agriculture also deal with cotton culture.

SUGAR-CANE: Brisbane (Tel. B 1541); Bundaberg (Sugar Experiment Station, Tel. 228); Mackay (Sugar Experiment Station, Tel. Kowai, Tel. 17); Innisfail (Tel. 271); Meringa (Sugar Experiment Station, Tel. Gordonvale 95); Cairns (Tel. 2589).

FRUIT AND VEGETABLES: Brisbane (Tel. B 1541); Coolangatta; Southport; Toowoomba; Warwick; Stanthorpe; Wallangarra; Dayboro; Nambour (Field Station, Tel. 175); Gympie; Gayndah (Court House); Rockhampton; Bowen; Townsville; and Cairns.

Advice on vegetable-growing is obtainable also from general agricultural advisory officers.

INSECT PESTS: Specialist Officers at Brisbane (Tel. B 1541); Gayndah (Court House); Rockhampton (cnr. Bolsover and Fitzroy Streets), Townsville.

PLANT DISEASES: Specialist Officers at Brisbane (Tel. B 1541) and Toowoomba (Long Street, Tel. 1990).

IDENTIFICATION OF PLANTS: Brisbane (Botanic Museum and Herbarium, Botanic Gardens, Tel. B 8243).

BEEKEEPING: Brisbane (Tel. B 1541).

SEED-TESTING: Brisbane (Tel. B 1541).

SHEEP AND WOOL: Brisbane (Tel. B 1541); Blackall.

DAIRYING AND CATTLE-RAISING: Officers of the Dairy and Stock Branches are stationed in a large number of country towns.

PIG-RAISING: Brisbane (Tel. B 1541).

POULTRY-RAISING: Brisbane (Tel. B 1541); Boonah (Stock Office).

VETERINARY SERVICES: Brisbane (Tel. B 1541); Yeerongpilly (Animal Health Station, Tel. JY 8005); Toowoomba (Tel. 547); Murgon; Rockhampton; Clermont; Townsville (Animal Health Station, Oonoonba, Tel. Townsville 484); Atherton.

The PIG FARM

Selection of the Boar.

E. J. SHELTON.

MUCH care has been given to the development of modern types of pigs, especially those now described as "rangy," and animals carrying length and well set up on strong legs and feet. In the production of the class of bacon pig for which there is a constant demand extra length is now regarded as most important. The selection of good type sows is equally one of the essentials in the breeding of first quality commercial bacon pigs and in the term "good type" is bound up those qualifications which the successful breeder looks for.

In recent years, altered market requirements have brought about a continuous demand for long-bodied, fleshy bacon pigs carrying a maximum of meat and a minimum of fat, the later of a firm, white texture and colour and well intermarbled with the lean meat.

Until lately it has been the practice to advise farmers who have brood sows of a thick-set chubby type to select a long-bodied rangy type boar with the idea that such a boar would counteract the tendency to shortness of body and heavy development of fat in the progeny. There is some soundness in such advice, and many farmers have followed it with satisfactory results. However, it should be remembered that feed and environment have an important influence on the development of pigs, and unless care is taken, these factors may largely override the results aimed at in breeding along the lines indicated. Actually, to accord with present requirements, it is better to eliminate short-bodied, thick-set sows in favour of longer-bodied, lighter shouldered animals which when mated with a rangy-type boar will produce long-bodied fleshy progeny—"big lean" pigs as against "short fat" ones. It is not suggested, of course, that pig raisers should at once set about altering the type, because the process is "selective" and so cannot be hastened.

It should be remembered, too, that the mating of a long-bodied rangy boar with long-bodied sows of similar type must be a progressive one, for it may be that some of the shorter-bodied, chubbier type sows actually do produce progeny of a definitely superior type of baconer, and they may even give better returns than would be obtained from rangy type sows.

The market requires a maximum of lean meat and a minimum of firm white fat. If that type of bacon is being produced from existing

breeding stock there would be little or no advantage in making any change until it becomes necessary to introduce a fresh sire or to replace some of the sows. Some pig raisers think that any old boar will do, so long as he will produce enough pigs. This is mistaken policy, for a pig receives about half its inherited characteristics from its dam and half from the sire. Thus, as all the young pigs will have half their characteristics from the one source, the sire, his selection becomes more important than that of the sows, important as that is, because the boar will be the sire of from ten to twenty times as many young pigs as the individual brood sow can produce and rear.



Plate 73.

A TYPE NOW POPULAR BECAUSE OF GREAT LENGTH OF BODY AND LIGHTNESS OF SHOULDER.—To Berkshire breeders of an older generation this boar would probably be "counted-out" on the ground that he has not that attractive appearance characteristic of the type of Berkshire popular thirty years ago. But the valuable characteristics of body length, depth of flesh, evenness in conformation should count in his favour.



Plate 74.

A VALUABLE ADDITION TO THE HERD.—This boar looks attractive as a show animal, and he is just as good as he looks, and has proved to be a very valuable addition to the herd of Mr. B. A. Schellback, of Kingaroy, Queensland.

Good and Bad Points.

Two points worth consideration in the selection of boars are an undershot jaw and an overshot jaw. Both are serious defects and interfere to a greater or lesser extent with digestion, because pigs which have overshot or undershot jaws cannot as a rule feed properly, and when run with a number of other animals seldom manage to get enough to eat.

There are minor differences in body conformation in the case of a boar as against the sow. There must be present all the characteristics of a good bacon type of pig, and in addition the particular feature common to boars, summed up as "masculinity." For example, the boar is a little more robust in build than the sow, and somewhat heavier in the bone, but definitely not coarse-boned. Again, the head is usually a little larger, and the shoulders heavier. The boar should show signs of a robust constitution, and come from a prolific family. Naturally, he should not be closely related to the sows, as there is always the risk in such cases of weakness in the progeny, and thus less resistant to disease. The boar's behaviour also is important. He should not be vicious, bad tempered, or sulky. The way in which a boar is handled while he is growing will decide to a great extent his temperament, but faults may be inherited. The boar should be active and ready to work; lazy boars are a nuisance, and can upset the planned routine of a breeding season. Sound feet are most important in a boar, and should receive special attention during selection. Heavy shoulders carrying a coarse hard shield should be avoided, and there should not be a crease behind the shoulders.

He should carry himself well, and should have a generally healthy, thrifty, "stylish" appearance, and look definitely masculine. In other words, his character should be apparent from his general appearance. An animal showing signs of rupture or any other obvious physical defect should, of course, be rejected. There should be at least 12 teats evenly spaced in pairs along the belly line, which should be level.

It is advisable to select boars and sows after they are three months old. If selected from a litter which is being weaned at eight weeks disappointment may follow, for often the pig which appeared the best then will not develop as well as one not so attractive at the time of weaning.

Mating should not be allowed until the pigs are well grown, usually after they are eight months old. If mated before this stage, they will still be growing; at the same time they have to meet extra demands on their bodies, and generally it is their growth that suffers. Thus a gilt that has been mated at six months has to gather enough nourishment for her litter and, at the same time, provide for her own body requirements. A far greater strain is imposed when she is suckling a litter. Sows which have had their growth restricted when young, because of too early mating, are usually not as profitable as those which have been allowed to grow well before mating. Therefore, the practice of mating pigs at six months to obtain early results is not economically sound.

When Buying a Boar.

As a good boar will quickly improve the standard of the herd, one should be obtained even if the price may seem high. The outlay involved will prove a sound investment. Under normal conditions, the value of a stud boar (slightly more than that of sows) is based on around one

guinea a month of age, thus a selected boar six months old at six guineas, plus expenses would be normal value; and one twelve months old from ten to twelve guineas, according to quality. The stud book registration fee in Australia is at present 5s. for each eligible pig. To be eligible, the animal must be one of a recorded litter—that is, one sired by, and from registered parents, and from a litter entered up in the litter record books.

Crates, unless paid for, are usually loaned by the vendor for transport, on the condition of prompt return, freight paid (if any).

The Queensland Railway Department has, since 1933, allowed a rebate of 20 per cent. on the transport of boars declared on the consignment note as "for breeding purposes," and a similar concession on breeding sows also is allowed. When stud boars or sows are being sent by rail for breeding purposes, the consignment note should be endorsed accordingly by the railway official receiving the consignment, otherwise the department would have no means of determining whether the pigs were forwarded for breeding purposes or for slaughter, for it is sometimes necessary to transport individual pigs to bacon factories in crates. The Railway Department should always be advised in ample time beforehand when stud pigs are to be consigned, so that suitable arrangements may be made for the quick transport of the animals to their destination.

BREEDING, FEEDING, AND MARKETING PIGS.

The pig industry of Australia was advancing rapidly immediately prior to the war, owing to the development of exports to the United Kingdom. Accompanying the expansion was a decided improvement in the breeding and general management of stock.

The war, unfortunately, brought about a drastic curtailment of the export business. Whatever may happen in the future the industry should always occupy a position of considerable economic importance in the Commonwealth, where there is scope for both increased production and consumption of pig products. To realise the latter, however, breeders will have to study market requirements more closely than they have done in the past. At the same time, production costs will need to be reduced to the lowest possible level by more judicious selection of breeding stock and management of the animals on still better lines.

—E.J.S.

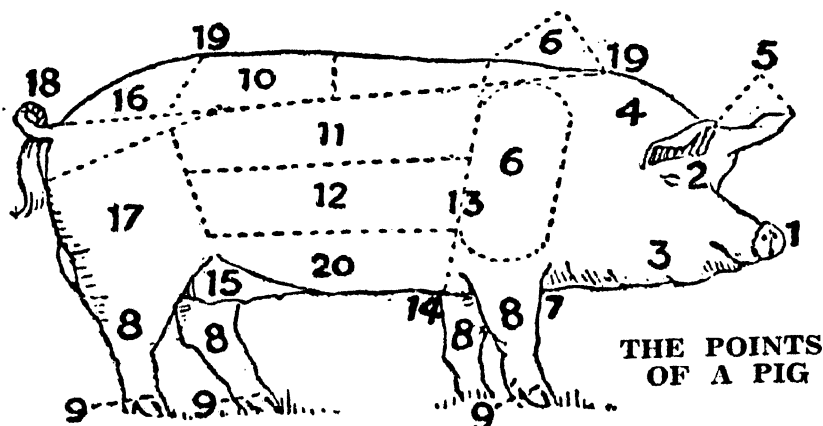


Plate 75.

1. Snout. 2. Face. 3. Jowl. 4. Neck. 5. Ears. 6. Shoulders. 7. Chest.
8. Legs. 9. Pastern. 10. Loin. 11. Ribs. 12. Side. 13. Girth. 14. Fore
Flank. 15. Hind Flank. 16. Rump. 17. Ham. 18. Tail. 19. Back. 20. Belly.



The Cleansing of Milking Machines.

THE DILUTE CAUSTIC SODA SOLUTION METHOD.

D. S. ROBERTSON, Dairy Inspector.

SUCCESSFUL operation of a milking machine depends on the care and time given to it. Any neglect in keeping it clean will be reflected in the grade of the cream supplied to the butter factory. The boiling water and caustic soda method has proved efficient in the cleansing of the milking machine, and in order that the method may be simply, yet thoroughly applied, the following essentials are required:—

- (1) A steam sterilizer for boiling water and providing steam.
- (2) Caustic soda.
- (3) An adequate supply of clean water.
- (4) A scrubbing brush and a pipe travelling brush.

To simplify this method, a routine system should be adopted, and the following has been found very satisfactory in actual practice:—

(1) Immediately after each milking wash all dirt from the exterior of the rubbers and teat cups, using a vessel and brush kept exclusively for this purpose. Draw 1 gallon of cold water through each set of teat cups; while doing this, withdraw the cups from the water several times, as this causes a surge of fluid through the pipes and rubbers, instead of a steady flow, and is more effective in removing milk. Always start on the set of teat cups farthest away from and work towards the releaser.

(2) After this has been done, draw through each set of teat cups at least 1 gallon of *boiling* dilute caustic soda solution, which is made by dissolving 1 teaspoonful of caustic soda in 4 gallons of *boiling* water. Care should be taken not to make this solution too strong, as strong solutions of caustic soda used over a period of time, tend to remove the tin plating from the milk pipes. While drawing the boiling caustic soda through the teat cups nearest the releaser, the flap at the end of the milk line should be lifted, and the torpedo brush (which should be first dipped in the caustic solution) run through the milk pipe. The vacuum will carry the brush through with sufficient momentum to effectively remove all trace of milk from the interior of the pipe. However, it should be remembered that the cord to which the brush is

attached should be long enough to enable the brush to travel the full length of the milk line. It is useless using a piece of cord which permits the brush to travel along a portion of the milk line and not the whole length. Catch the caustic soda solution and keep it for flushing of air-line.

(3) After running the torpedo brush several times through the milk line, the whole of the milk system should be flushed with clean, *boiling* water, in order to remove all traces of the soda solution. It should be clearly borne in mind that *no* caustic soda must be added to this water. At least 1 gallon, preferably 2, of clean, boiling water should be run through each unit. This water may be caught in a clean vessel and used for flushing the air lines.

(4) After this has been done, the entire milk system should be sterilized with steam from the steam sterilizer, but it should always be remembered that it is harmful to use steam, unless the machine has first been thoroughly cleaned as described above. If steam is applied to the machine before removing all traces of milk, the heat of the steam will bake the casein of the milk on to the interior of the pipes. This casein forms a hard, yellow deposit which is a favourable breeding ground for bacteria.

(5) Draw air through the entire plant for a sufficient time to dry out any residual moisture. This will leave the system completely dry, and thus unfavourable for growth of bacteria between milkings. The air line should be cleaned once a day, by flushing with the soda solution, and the hot water collected from the cleaning of the milk lines.

After all operations have been completed, the engine should be stopped and the releaser removed, dismantled, thoroughly washed, and sterilized with steam. The vacuum tank should then be removed, washed, sterilized, and both it and the releaser should be stored in some dust-free position.

After completing the cleaning of the machine, all rubber stops should be removed, and together with the teat cups and rubbers, should be immersed in lime water. This lime water is made by dissolving 2 lb. of quicklime in 10 gallons of clean water. After the mixture has been well stirred and allowed to settle, the clear fluid is decanted and this is used for the purpose described. Limewater not only assists in keeping the teat cups and rubbers sweet and clean, but also helps to prolong the life of the rubberware. Limewater should be changed very frequently—at least twice a week.

After re-assembling the milking machine and before commencing to milk, it is good practice to flush the milk system with clean, cold water containing a chlorine preparation. The amount of chlorine to be used for this purpose is usually indicated on the label of the package.

Finally, it should always be remembered that the machine should be totally dismantled at least once weekly and thoroughly cleansed and sterilized.

Summarised, the procedure in the cleaning of machines by the dilute caustic soda boiling water solution method is:

(1) Rinse each unit with at least 1 gallon of cold water.

(2) Run through the milk system a boiling, dilute caustic soda solution (1 teaspoon of caustic soda to 4 gallons of *boiling* water), using 1 gallon of the solution to each set of teat cups.

(3) Run plain *boiling* water through each set of teat cups, using at least 1 gallon (preferably 2) of boiling water for each unit. Sterilize the milk system with steam from the sterilizer, and dry by drawing air through the system.

(4) Once daily, clean the air lines in a similar way to that used for the milk system, using the same soda solution and clean boiling water.

(5) Remove and dismantle the releaser and vacuum tank, wash each thoroughly, sterilize with steam and leave to drain in a dust-free place.

(6) Disconnect teat cups and rubbers, and together with all rubber plugs, immerse in limewater. Open up all flaps on the milk lines.

(7) Completely dismantle the machine and clean and sterilize at least once a week.

(8) Just before each milking flush the milk system with clean, cold water containing a chlorine compound in the proportion indicated on the label on the package.

The Sediment Test for Milk.

C. R. TUMMON.

THE sediment test is a simple test applied to liquid milk in order to ascertain the amount of visible dirt in it. It is in no way intended to replace the methylene blue test, which provides an estimation of the amount of bacterial activity, but rather should it be used in conjunction with the methylene blue test for better results. The sediment test is of considerable importance at factories or milk-receiving depots to find out, with a minimum of trouble, the extent of the visible dirt in individual suppliers' milk. Factories might consider the adoption of some method of preserving these filter wads to enable the farmers to see for themselves the condition of their milk when received. The wads could either be sent back to the farmer for his inspection or be mounted on a chart, allotting certain points to each pad according to its condition, and placing it in a prominent position in the factory for inspection by all. This often serves a useful purpose in getting an unsatisfactory producer to bring about the necessary improvement in his supply.

Principle of Test.—In taking a sediment test, a metal tubular container with a capacity of 1 pint, to which a length of rubber tube is attached, is used. The rubber tube fits on to a nipple on the lid of the container. This is to enable pressure to be applied by hand pumping to force the milk in the container through a small cotton wool filter pad in the bottom. This pad is placed between a wire gauze and rubber washer and held on to the tapered end of the container with a special cap, which also has a hole in the centre to allow the milk to pass straight through when pressure is applied. After the milk is forced through, the wad is removed and the amount of visible dirt in one pint of the milk can then be seen.

How to Obtain a Satisfactory Sediment Test.—When a farmer is advised that the sediment test applied to his milk has shown unsatisfactory results, he should carefully check over all his operations in the production and handling of milk, and endeavour to find the cause and remedy it immediately.

In order to ensure satisfactory sediment test results, attention should be given to the following factors:—

1. Most important of all—always wash the cows' teats and udders and dry them before commencing milking. This is necessary in dry as well as wet weather. Dry milking is then an easy matter as the teats are softened by this washing. Milkers' hands should be frequently washed in the course of milking operations.

2. Always strain all milk through cotton wool filter pads. If many cows are being milked the pad should be changed in the course of milking. Use a wide-mesh gauze on the strainer to expedite straining.

3. Do not include milk from cows affected with mastitis. This often shows up as tiny blood spots, or white or yellow deposits on the filter pad of the sediment tester.

4. Keep dust in the yard down to a minimum to avoid its being stirred up by the cattle and settling in milk buckets.

5. Make sure that all milking buckets, cans, and/or other utensils are washed before putting milk into them, as often dust accumulates in utensils between milking.

6. Keep cans of milk in a dust-free place while awaiting transport.

It should be clearly understood by producers that straining is only a precautionary measure. The objective should be to exclude dirt as much as possible by cleanly shed methods, rather than to rely on straining to remove it. The straining merely removes the hairs and larger particles of dirt, but most of the bacteria thereon still pass through the strainer into the milk.

THE HEAD OF THE HERD.

Points to be observed in selecting a good dairy bull are:—

1. That he is pure bred and well bred—the two characteristics go together. Only bulls which have the backing of closely related, good producing ancestors can improve a herd. Most good bulls are registered, but not all registered bulls are good.

2. That he is prepotent and masculine. The bull which is prepotent stamps his calves with his own qualities. To pass on his good qualities, he must be pure bred, well bred, strong, and energetic.

3. That he is well built and full size. Look for a wide muzzle, broad forehead, prominent eyes, deep chest, big barrel, open-jointed frame, and loose skin. Always reject an under-sized bull.

4. That he is healthy and vigorous. For best results, perfect health of the bull, as well as the cow, are most important. Vigour and vitality are necessary. It simply does not pay to persevere with a lazy, sleepy bull.

L. VERNEY.

Queensland Cheese Production, 1943-44.

E. B. RICE, Director of Dairying.

QUEENSLAND cheese production of 24,041,645 lb. (approximately 10,733 tons) for the year ended 30th June, 1944, was decidedly below that of the State's record output of 27,730,083 lb. (12,724 tons) for 1942-43. This decrease was mainly attributable to seasonal conditions, but the closure of cheesemaking annexes at two butter factories, the diversion of some cheese factory milk supplies to supplement the Brisbane city milk supply in the past dry winter and some loss of suppliers in other factory areas were contributory factors.

Production in the first quarter of the year was affected by the unusually dry and cold winter conditions, but output steadily increased after the early spring rains, and during early and midsummer. However, adverse conditions in the late summer and autumn seriously depressed production for the remainder of the year.

The gross value of the year's production was estimated at £1,159,250 and the average price per pound butterfat received by cheese factory suppliers in the year was 2s. 1½d.

Because of the changed position in relation to the overall requirements for butter, whereby the restriction on the export of second grade butter has been lifted and markets are assured for all production, applications from producers for exemption from supplying cheese factories are now treated sympathetically; the satisfactory returns from cheese factories in comparison with returns from butter factories have enabled the former to maintain supplies. Moreover, it is neither necessary nor desirable for any upset in supply arrangements and because of the necessity for the conservation of tyres, trucks, and liquid fuel, duplication of transport services for both milk and cream along roads is not at present permissible.

The total quantity of cheese officially graded by State and Commonwealth officers was 16,591,676 lb., representing 69.01 per cent. of output. The results are summarised hereunder:—

Grade	Choice	First	Second	Third
Percentage:	1.49	74.16	24.33	0.02
Number of factories of which output of choice and first grade cheese exceeded 90 per cent.	14
Number of factories of which output was between 80 and 89 per cent.	9
Number of factories of which output was between 70 and 79 per cent.	7
Number of factories of which output was between 60 and 69 per cent.	7
Number of factories of which output was between 50 and 59 per cent.	4
Number of factories of which output was between 30 and 49 per cent.	4
Number of factories of which output was between 10 and 29 per cent.	2
Number of factories of which output of choice and first grade cheese was less than 10 per cent.	3
Number of factories without any choice and first grade	1

The attached table prepared by Miss Horsley of the Dairy Branch contains information respecting the manufacture and gradings of the individual factories; this information should prove of interest to all factories and suppliers.

It also is of interest to record that in addition to small quantities of Gruyere and Roman cheese made in Queensland for some years, two kinds new to commercial manufacture in this State—cottage cheese and homogenised cheddar cheese—were marketed. The homogenised cheddar cheese resulted from attempts to produce a type of cheese capable of withstanding tropical weather conditions without excessive exudation of fat.

PRODUCTION, YIELD, AND GRADINGS OF CHEESE IN ALL FACTORIES FOR TWELVE MONTHS ENDED 30TH JUNE, 1944.

Factory.	Production and Yield.						Gradings.				
	Milk Received.	Cheese Green Weight.	Butterfat.	Cheese Yields per 100 Milk.	Cheese Yields Lb. Butterfat.	Average Test.	Total Lb. Submitted.	Choice.	First.	Second.	Third.
Aubigny	Lb. 1,681,520	Lb. 172,848	Lb. 61,082	Lb. 10.28	Lb. 2.82	% 3.63	Lb. 165,373	..	89,839 lb. 54.32 % 638,264 lb.	75,534 lb. 45.68 % 52,211 lb.	..
Biddeston	8,271,357	882,110	310,712	10.66	2.84	3.76	718,793	28,318 lb. 3.94 %	88.8 % 124,656 lb.	7.26 % 220 lb.	..
Chinchilla (closed Nov., 1943)	1,081,653	110,188	38,816	10.19	2.84	3.59	124,876	..	99.82 % 485	0.17 % 42,414 lb.	..
Coalstoun Lakes	1,881,577	188,773	70,237	10.03	2.69	3.73	43,842	..	1.11 % 200,151 lb.	96.74 % 96,896 lb.	943 lb. 2.15 %
Daredale	3,183,244	309,992	117,256	9.74	2.64	3.68	279,047	..	67.38 %	32.61 %	..
Downs—											
Boodua	2,236,024	234,429	88,608	10.48	2.64	3.96	142,396	..	116,383 lb. 81.73 % 129,666 lb.	26,013 lb. 18.26 % 68,620 lb.	..
Toowoomba	5,597,243	586,485	..	10.48	..	..	198,286	..	65.39 %	34.61 %	..
Dundarrah	1,438,767	137,946	52,684	9.59	2.62	3.66	27,693	..	..	20,353 lb. 73.49 %	7,340 lb. 26.5 %
Felton	5,552,286	604,160	212,871	10.88	2.84	3.83	373,743	..	260,999 lb. 69.83 % 720 lb.	112,744 lb. 30.17 % 113,435 lb.	..
Greenmount	2,896,750	305,887	111,351	10.55	2.75	3.84	117,245	..	4.934 lb. 3.01 % 462,890 lb.	96.75 % 92.6 % 39,275 lb.	3,090 lb. 2.63 % 7,178 lb.
Highgrove	2,237,167	231,232	86,796	10.33	2.66	3.88	163,660	..	90.65 % 488,778 lb.	7.69 % 55,606 lb.	..
Irongate	5,146,830	540,112	191,007	10.49	2.83	3.71	510,613	8,448 lb. 1.65 % 18,895 lb.	3.95 % 306,977 lb.	11,575 lb. 3.63 %	..
Koorongarra	5,682,028	578,348	211,359	10.18	2.74	3.72	563,277	..	..	..	..
Lilyvale	3,143,827	332,531	119,156	10.58	2.79	3.79	318,552	..	..	..	..
Malling	5,576,602	536,351	210,067	9.62	2.55	3.77	..	..	..	..	..
Macdagan Valley— Macdagan	8,293,988	835,279	310,470	10.14	2.70	3.75	780,040	..	350,223 lb. 44.9 % 410,336 lb.	429,817 lb. 55.1 % 150,907 lb.	..
Kulpi	7,263,467	736,099	269,814	10.13	2.73	3.71	578,804	17,561 lb. 3.03 %	70.89 %	26.07 %	..

PRODUCTION, YIELD, AND GRADINGS OF CHEESE IN ALL FACTORIES FOR TWELVE MONTHS ENDED 30TH JUNE, 1944.

Factory.	Production and Yield.						Gradings.				
	Milk Received.	Cheese Green Weight.	Butterfat.	Cheese Yields per 100 Milk.	Cheese Yields per Lb. Butterfat.	Average Test.	Total Lb. Submitted.	Choice.	First.	Second	Third.
Maryborough—	Lb.	Lb.	Lb.	Lb.	Lb.	%	Lb.				
Kingaroy ..	3,869,043	379,232	153,577	9.80	2.47	3.97	207,296	..	136,224 lb. 65.71 %	71,072 lb. 34.28 %	..
Tansey ..	6,661,597	698,115	272,592	10.48	2.56	4.09	553,855	3,308 lb. 0.59 %	547,161 lb. 98.79 %	3,386 lb. 0.61 %	..
Wondai ..	3,516,810	351,332	136,444	9.99	2.57	3.88	142,336	..	139,126 lb. 97.74 %	3,210 lb. 2.25 %	..
Maxam ..	6,147,149	647,241	242,477	10.53	2.67	3.94	579,421	..	480,063 lb. 82.85 %	99,358 lb. 17.15 %	..
Moola ..	6,349,298	643,093	244,361	10.13	2.63	3.85	546,258	..	481,245 lb. 88.1 %	65,013 lb. 11.9 %	..
Mount Sibley ..	3,310,233	352,550	130,547	10.65	2.70	3.94	343,194	..	268,710 lb. 78.3 %	74,484 lb. 21.7 %	..
Mount Tyson ..	8,338,424	889,507	313,369	10.67	2.84	3.76	677,442	3,440 lb. 0.5 %	640,208 lb. 94.5 %	33,704 lb. 5.0 %	..
Nanango (closed Dec., 1943)	1,085,606	100,314	35,327	9.24	2.84	3.25	81,157	..	44,584 lb. 54.93 %	35,431 lb. 43.66 %	1,142 lb. 1.4 %
Oakey-Kelvinhaugh ..	3,243,281	334,964	124,421	10.33	2.69	3.84	317,088	..	268,623 lb. 84.71 %	47,886 lb. 15.1 %	579 lb. 0.18 %
Pauls Ice Cream and Milk, Merrimac ..	411,685	41,675	15,398	10.12	2.706	3.74	32,127	..	27,654 lb. 86.08 %	4,473 lb. 13.92 %	..
Pittsworth—											
Pittsworth ..	10,098,185	1,055,542	406,714	10.45	2.59	4.03	582,846	61,895 lb. 10.62 %	519,840 lb. 89.19 %	1,113 lb. 0.19 %	..
Brookstead ..	3,204,408	333,396	122,970	10.40	2.71	3.84	310,562	7,420 lb. 2.39 %	186,041 lb. 59.9 %	116,061 lb. 37.37 %	1,040 lb. 0.33 %
Linthorpe ..	3,945,878	401,779	146,705	10.18	2.74	3.72	330,437	..	255,362 lb. 77.28 %	75,075 lb. 22.72 %	..
Scrubby Mountain ..	2,318,146	240,195	88,571	10.86	2.73	3.82	136,073	..	52,057 lb. 38.26 %	81,145 lb. 59.63 %	2,871 lb. 2.11 %
Springside ..	4,082,980	428,376	149,800	10.49	2.86	3.67	211,822	50,402 lb. 23.79 %	159,370 lb. 75.24 %	2,050 lb. 0.97 %	..
Yarranlea ..	6,671,691	691,660	252,324	10.37	2.74	3.78	419,924	5,600 lb. 1.33 %	379,635 lb. 90.41 %	34,029 lb. 8.10 %	640 lb. 0.15 %
Port Curtis—											
Bracewell ..	6,486,196	656,758	242,344	10.12	2.71	3.74	223,143	..	206,200 lb. 92.41 %	16,943 lb. 7.59 %	..
Theodore ..	2,544,287	265,297	95,325	10.43	2.78	3.75	19,383	..	6,500 lb. 33.53 %	12,883 lb. 66.46 %	..

Queensland Agricultural High School and College										
Quinalow	13,040	1,333	547	10.22	2.44	4.19	699,816	..	514,849 lb. 73.57 %	184,967 lb. 26.43 %
Ramsay	7,894,869	742,775	272,222	10.04	2.73	3.68	267,560	..	182,592 lb. 81.648 lb.	3,320 lb. 1.24 %
Rockview	2,874,914	288,515	109,997	9.86	2.58	3.83	245,741	..	102,737 lb. 30.51 %	68.24 %
Rocky Creek	2,768,342	298,794	109,058	10.70	2.74	3.9	431,529	..	85,306 lb. 143,004 lb.	41.81 %
Rosemount	4,576,060	480,071	167,188	10.49	2.87	3.65	468,432	..	363,467 lb. 58.19 %	19.77 %
Southbrook	4,972,429	503,027	190,173	10.12	2.64	3.82	605,112	..	20.46 %	9.125 lb. 1.94 %
South Burnett— Goomeri	7,387,090	775,524	274,708	10.5	2.82	3.72	509,628	984 lb. 0.16 %	585,033 lb. 96.68 %	2,228 lb. 0.37 %
Murson	7,376,108	756,925	294,350	10.26	2.57	3.99	498,534	..	65,004 lb. 87.25 %	..
South Coast Dairy, Southport	6,004,577	592,645	239,844	9.87	2.47	3.99	..	..	157,285 lb. 31.55 %	..
Sugarloaf	2,196,684	227,401	90,023	10.35	2.53	4.09	161,090	..	63,842 lb. 39.51 %	730 lb. 0.45 %
Sunnyvale	1,880,580	194,151	73,412	10.32	2.64	3.9	137,440	..	106,105 lb. 77.20 %	3,840 lb. 2.79 %
Warwick— Greynare	2,747,998	279,015	103,286	10.15	2.7	3.76	129,786	..	46,119 lb. 35.53 %	..
L. J. Swamp	1,326,596	137,404	51,404	10.36	2.67	3.87	3,815	..	635 lb. 5.17 %	..
Talgai	1,933,050	201,779	74,476	10.44	2.71	3.5	1,336	..	..	..
Victoria Hill	1,160,890	123,068	42,737	10.52	2.88	3.65	..	..	..	..
Mill Hill	15,229,989	1,505,224	585,767	9.88	2.57	3.85	543,546	24,024 4.17 %	76,975 lb. 14.45 %	..
Woodleigh	2,568,265	258,647	96,049	10.07	2.69	3.74	241,934	..	182,844 lb. 24.12 %	..
Yamston	3,023,199	323,149	114,008	10.48	2.84	3.77	301,431	..	152,033 lb. 50.43 %	..
Yargullen	4,888,506	519,205	187,809	10.62	2.76	3.84	493,404	16,411 lb. 3.33 %	108,360 lb. 21.96 %	5,106 lb. 1.03 %
Totals	293,798,313	24,041,648	8,712,710	10.28	2.75	3.72	16,591,676	246,704 lb. 1.49 %	3,967,498 lb. 24.33 %	46,890 lb. 0.02 %

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the advanced Register of the Herd Books of Australian Illawarra Shorthorn and Jersey Cattle Societies. Production records for which have been compiled during the month of July, 1944 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
Lb.				
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
Happy Valley Marcheta 4th	.. .. R. R. Radel, Coalstoun Lakes	.. .. 8,729.44	389.226	Sunnyview Artist
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Yarranvale Larkspur	.. .. W. Henschell, Yarranlea	.. .. 12,775.5	477.611	Bri Bri Hason
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Alfa Vale Myrtle 4th	.. .. W. H. Thompson, Nanango	.. .. 12,091.05	532.751	Pearhos Pansy's Pride
Glen Idol Miss Jean	.. .. P. Doherty Estate, Gympie	.. .. 10,138.15	436.676	Blackland's Count
Happy Valley Molly Belle 2nd	.. .. R. R. Radel, Coalstoun Lakes	.. .. 8,104.12	335.94	Sunnyview Artist
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Tabbagong Ruth 35th	.. .. J. Crookey, Allora	.. .. 8,889.5	363.724	Parkview Consul
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Yarranvale June	.. .. W. Henschell, Yarranlea	.. .. 7,631.82	279.42	Trevor Hill Bosca
Glen Idol Melba	.. .. P. Doherty Estate, Gympie	.. .. 6,640.6	266.036	Blackland's Count
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Silver Glen Larkspur (239 days)	.. .. V. R. Nugent, Murgon	.. .. 7,275.8	280.297	Aynsley Renell
JERSEY.				
MATURE COW (STANDARD 350 LB.).				
Treacine Jersey Queen 2nd	.. .. T. A. Petherick, Lockyer	.. .. 7,169.55	384.231	Trinity Some Officer
Treacine Some Tot 3rd	.. .. W. Griesheimer, Leyburn	.. .. 6,685.6	378.644	Jerseylea Golden Duke

JUNIOR, 4 YEARS (STANDARD 310 LB.).									
Hocknell Walmate Creamery	..	..	N. C. Webb, Beaudesert	..	..	..	8,466.55	465.387	Hocknell Golden Surprise
Ashview Larkspur	..	..	C. Huey, Sabine	..	..	..	6,932.25	447.648	Lermont Volunteer
SENIOR, 3 YEARS (STANDARD 290 LB.).					..	..	..	..	..
Kathleigh Ripple	..	..	W. Griesheimer, Leyburn	..	..	..	7,309.75	372.52	Calton Larris
SENIOR, 2 YEARS (STANDARD 250 LB.).					..	..	..	..	..
Ashview Chimes	..	..	C. Huey, Sabine	..	..	..	7,331.45	306.69	Trearne Victor 4th
Lermont Fairy Maid (247 days)	..	..	P. H. Schull, Oakey	..	..	..	4,939.6	303.923	Woodside Golden Volunteer
Brooklands Choice Snow Cream	..	..	W. S. Conochie, Sherwood	..	..	..	5,527.75	255.608	Brooklands Choice Peer
JUNIOR, 2 YEARS (STANDARD 230 LB.).					..	..	..	..	..
Ashview Mischief	..	..	C. Huey, Sabine	..	..	..	6,193.55	328.56	Torquay Prince 2nd
Mayfair Beauty 5th	..	..	J. W. Carpenter, Helidon	..	..	..	5,296.25	312.58	Trearne Golden King 2nd
Mayfair Roseslip 5th	..	..	J. W. Carpenter, Helidon	..	..	..	4,534.95	312.38	Trearne Golden King 2nd
Lermont Dot	..	..	J. Schull, Oakey	..	..	..	6,039.45	299.897	Lermont Ambassador
Ashview Fashion	..	..	C. Huey, Sabine	..	..	..	5,879.55	295.526	Trearne Victor 4th
Lermont Model	..	..	J. Schull, Oakey	..	..	..	5,277.55	281.206	Selseys Samares Hallmark
Meadowvale Spot	..	..	Young Bros., Kingaroy	..	..	..	4,597.3	268.758	Banyule Silver Emblem
Ashview Madeiriette	..	..	C. Huey, Sabine	..	..	..	4,521.61	264.466	Trearne Victor 4th
Woodview Lynn	..	..	P. H. Schull, Oakey	..	..	..	4,447.1	232.977	Lermont Victory

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn and Jersey Cattle Societies, production records for which have been compiled during the month of August, 1944 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
Brundah Fancy	C. O'Sullivan, Greenmount	11,686-0	481-675	Greyleigh Eros
Trevor Hill Maple	G. Gwynn, Umbram	10,361-35	414-759	Corinna Supreme
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Jamberoo Marjorie 6th	M. J. Brosnan, Clifton	9,696-25	427-886	Greyleigh Valiant
Mountain Camp Thelma 26th	W. Caldwell, Bell	9,502-51	349-817	Trevor Hill Reflection
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Navillus Countess	C. O'Sullivan, Greenmount	8,419-5	344-152	Greyleigh Eros
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Yarranvale Melva	W. Henschell, Yarranlea	9,184-65	350-346	Trevor Hill Rosca
Trevor Hill Crystal 2nd	G. Gwynn, Umbram	8,088-22	346-343	Rosenthal Musketeer
Glen Idol Florrie 6th	Estate of P. Doherty, Gympie	7,382-25	311-605	Blacklands Count
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Navillus Viola 6th	C. O'Sullivan, Greenmount	7,502-0	317-17	Greyleigh Eros
Navillus Daphne 4th	C. O'Sullivan, Greenmount	7,737-0	307-262	Greyleigh Eros
Navillus Countess 2nd	C. O'Sullivan, Greenmount	7,604-0	302-631	Greyleigh Eros
Yarranvale Kiddy	W. Henschell, Yarranlea	6,833-43	287-203	Trevor Hill Rosca
Navillus Colleen	C. O'Sullivan, Greenmount	6,082-0	269-85	Parkview Limerick
Beleena Charm 6th	K. Roche, Sladevale	6,592-1	266-523	Tara Governor
JERSEY.				
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Chaldon Young Lady	J. J. Ahern, Conondale	7,438-3	343-958	Yaralla Duke of Gloucester
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Lernmont Sunlight	J. Schull, Oaksey	7,614-5	346-481	Woodside Golden Volunteer
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Boree Daffodil	W. and C. E. Tudor, Branch Creek	6,470-67	342-642	Maunfield Larkspurs Gift
Lernmont Katie	J. Schull, Oaksey	5,581-0	270-205	Woodside Golden Volunteer
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Hoeknell Bravo Camilla	N. C. Webb, Beaudesert	5,824-7	338-361	Navua Victoires Lad
Lernmont Thicketbell	J. Schull, Oaksey	6,950-9	329-056	Selsey Samares Hallmark
Lernmont Flower	J. Schull, Oaksey	6,507-95	278-834	Selsey Samares Hallmark
Teonema Hawthorn (220 days)	W. J. Semgreen, Coolabunia	4,424-9	244-635	Trinity Golden Royal
Lernmont Patsy	J. Schull, Oaksey	4,777-0	231-456	Woodside Golden Volunteer



Dentition in Sheep.

J. L. HODGE, Instructor in Sheep and Wool.

THE ages of sheep are generally indicated by the number of permanent teeth each is carrying. This is not strictly accurate as the appearance of the permanent teeth varies to some considerable extent, dependent on the country on which they are raised. Instead of referring to a flock as two-tooth (one year old) or four-tooth (two years old) and so on, it is more accurate to describe the ages in such terms as one year, two years old, and so on up to four years when a sheep is showing eight permanent teeth. However, as mentioned, the practice of indicating the age by the number of permanent incisors is so general that it will be adhered to by most growers. A lamb has all temporary or sucking teeth. At about 13 to 15 months of age, the two permanent incisors appear. The sheep is then called a "two-tooth."

At from 18 months to 24 months of age two more permanent teeth appear, one on either side of the original permanents. The animal is then known as a "four-tooth." At the age of 30 months to three years the four permanent incisors are again added to by two permanent teeth on each side of the original four, thus the sheep becomes a "six-tooth." When a sheep becomes about 42 months old and up to four years, yet another pair of permanent incisors make their appearance on the outside of those already there. The sheep is then referred to as a "full mouth."

It may be thought that the intervals given for the appearance of the teeth are elastic, but this cannot be avoided as so much depends on the country and the state of the pastures.

After four years a sheep is referred to as "aged" and the correct age can be indicated only by the soundness or otherwise of the mouth. It is especially from four years upwards that a prospective buyer gets the benefit of the strictly correct reference to ages in years.

Definition of Ages of Young Sheep.

There is sometimes controversy on the subject of ages and definitions of young sheep. The following may, therefore, prove useful. The term "lamb" as applied in the sheep industry refers to a young sheep of either sex or breed showing milk teeth only and still sucking its mother. Probably the oldest age to fulfill these conditions is five months. In the case of crossbred sheep, lambs at five months would, under ordinary conditions, be marketed as fat lambs, and would therefore miss the "weaner" stage. In merino circles, a lamb becomes a weaner on removal from its mother. In an adverse season, crossbred

lambs have sometimes to be weaned and their condition maintained, if practicable, on fodder crops. These young animals are known as "carry over" lambs and the actual age may vary greatly. At Cannon Hill saleyards the selling agents class anything as a lamb which does not show two permanent teeth.

A hogget is a young sheep of either sex, round about twelve months old, which has not been shorn as a lamb, and therefore, with a twelve months' fleece, still carries a lamb's "tip."

Lamb: Up to five months of age.

Weaner: From weaning time to hogget stage.

Hogget: Round about twelve months old carrying original fleece.

Two-tooth: About fifteen months old carrying two permanent teeth.

Better Merino Flocks.

J. L. HODGE.

WITHOUT taking a pessimistic view of the future of wool after hostilities cease, it may, at least, be said that there is some uncertainty in the position. It is not the present intention in this article to touch on the marketing of the staple, but to remind breeders of the necessity for producing the very best that circumstances and the country grazed will permit. It should be remembered always that only the best of wool will compete successfully with synthetic fibres on a price basis.

Culling the Ewe Flock.

Culling the ewe flock, therefore, has become even more important than formerly. This work should become a permanent part of yearly practice on the station or grazing farm. The work should be entrusted only to first-class men, proved for their ability to not only select the best, but also with a complete understanding of the type to grow in a particular district.

In the forefront of the classer's mind should be type to suit the particular property, and district. To achieve fast and permanent improvement in the flock, this matter of type should be adhered to rigidly year after year. Different localities demand different types of merino sheep to ensure that the best may be got out of a flock. For instance, in the arid regions of the Far-west and North-west to attempt to grow the finest of merinos would be definitely wrong practice. In those regions a sheep requires, above all other characteristics, constitution and size. A sheep should be sound of constitution and hardy enough to stand up to hardships so often encountered in those areas. A strong wool, or a strong medium wool should, therefore, be chosen for the districts under discussion. Nearer in, where the country is suitable and rainfall is more assured, finer merinos may be depastured.

Culling achieves only half its object, unless with it goes the use of better rams. A few guineas in the price of rams is neither here nor there, provided the right sires are purchased to "nick" with a particular line of ewes. Here again it is very desirable that the person buying the rams should have a sound knowledge of the ewe flock with which it is proposed to join them. Money is often wasted in the indiscriminate

purchase of rams, some of which should not see the ewes. This does not altogether mean that the rams themselves are indifferent members of their breed, but that they are of the wrong type for the ewes intended to be mated with them. Having found a stud, the progeny of the rams from which have given satisfaction, the grower is strongly advised to stick to that stud, or at least, should a change be desirable, to purchase from a stud established on similar blood lines. Chopping and changing from stud to stud is a dangerous practice for the beginner, very often resulting in culls out of all proportion.

The Mating Age.

Ewes should be well grown before joining. If well developed, eighteen months of age is the best time. Breeding from young stock often interferes with natural development, and seriously minimises the cut one would expect from a selected line of ewes. Time to join depends, to a great extent, on locality, seasonal rainfall, and to no small extent, the prevalence or otherwise of blowfly attack in the particular locality.

Progeny Testing.

Progeny testing is receiving much publicity these days, and rightly so. However, the practice is carried out to a far greater extent than is generally supposed. It is not often that a stud breeder, purchasing a high-class sire for the stud, joins the ram with his top ewes until he has been tried out on other ewes and his progeny carefully observed.

Within the flock it is thought that much more could be done in the matter of selective breeding, as against the usual practice of indiscriminate breeding. The difference in these two methods consists in the selection of rams for selected ewes to suit them, as against the almost universal practice of joining a certain percentage of rams with the whole ewe flock.

In capable hands, this selective breeding is well worth the extra work involved, and should quickly reduce the proportion of sheep to be culled from a given flock. On large stations it is sometimes an annual practice to cull as deeply as 33 per cent. irrespective of the quality of the sheep. This has its advantages where large numbers are depastured, but the smaller man would be well served with the removal of those sheep not true to type or culled for other outstanding faults.

From a State point of view it is very desirable that all culls eventually come into the fat stock market.

TAKING THE FORGE TO THE FARM.

Queenslanders in sheep and cattle country all know the travelling saddler, and how welcome he is on a grazing property when saddles have to be counter-lined and all sorts of leather gear has to be replaced or repaired. Well, in New Zealand, a travelling blacksmith shop is a familiar sight in at least one district where, instead of the farmers going to the blacksmith, the blacksmith comes to them.

An enterprising local lad thought it would be a good idea to provide himself with a portable forge, so he bought a truck and fitted it up as a mobile workshop—anvil, bellows, and all—established a business connection with district farmers, and arranged regular visits to their farms to shoe horses and do general work calling for a blacksmith's skill. The idea caught on with the farmers, and the travelling blacksmith is now regarded as indispensable.

In the slack season the travelling blacksmith does a bit of shearing or takes on tractor-driving to keep going.



Culling.

P. RUMBALL.

POULTRY raisers at this time of the year commence to give serious consideration to removing from their flocks the poorer layers. The practice is generally forced upon farmers due to the fall in egg values in order to make ends meet.

The position is somewhat different today. Egg values are much higher at this time of the year than they normally are, and feed costs have made no corresponding increase. Therefore there may not be the urge to follow usual practices.

The need for culling today is equally as important as at any period. In the first place the best returns cannot be obtained without this practice being followed, and secondly the feed position is not particularly



Plate 76.

THE HEAD OF A GOOD LAYER.—Note the alertness of appearance and freedom from coarseness. The bald head is frequently associated with high production.



Plate 77.

HEAD OF AN ALERT, ACTIVE BIRD FROM WHICH HIGH EGG PRODUCTION CAN BE EXPECTED.



Plate 78.

HEAD OF A BIRD INCLINED TO BE COARSE.—A type of head not associated with high production.

bright. To feed the poultry flocks of this State probably something over 2 million bushels of wheat is necessary annually. Most of this has to be brought into the State, and just now all.

Culling reduces the call upon wheat and will assist in avoiding those periods where it has been so difficult to obtain supplies. Protein rich foods are also in short supply. The feeding of indifferent egg producing birds reduces the amount available to the birds that are able to give a good account of themselves if they were supplied with the means to do so.

In egg laying competitions an average individual production of 200 or more eggs is usual. This average is not impossible for the poultry raiser to obtain from a flock of well-managed pullets. However, in the second year of a hen's life production is much lower than in her first. Some excellent first-year producers may be exceptionally poor in their second. A similar relationship exists between the production of the second and third year, but with the difference that third-year birds invariably do not lay enough eggs to warrant their retention in the flock.

Culling, therefore, in the first instance, revolves around the disposal of old hens.

In addition to culling for age, all obviously unfit birds, from chickens to the oldest hens, should be removed from week to week. The main culling should be practised in the summer.

Before culling, the conditions under which birds are housed and fed should be considered. Only well-treated birds can have the external features of a good layer. If the treatment has not been correct this should be remedied, and the birds given at least 6 weeks to respond.



Plate 79.

METHOD OF ASCERTAINING THE DISTANCE BETWEEN THE PELVIC BONES AND THE KEEL
REFERRED TO AS CAPACITY.

Well managed and regularly culled flocks require little culling during the summer, apart from culling for age. In badly bred and poorly managed flocks considerable culling is necessary. Hens that have given two years' production should, with few exceptions, be culled for age.

Birds should be gathered and examined on the ground first. A good producer should be bright, alert, and active, and should have length, width, and depth of body. Birds without these characteristics should be rejected. All small, undersized birds, although of active appearance, should be removed. This work may be done best in the fowlhouse. The birds should be caught with a fish landing net. The other birds should be handled, and the best way to catch them is to round them up in a corner, using a piece of 6-foot netting, enclosing 20 to 30 at one time. In the further examination it must be borne in mind that a moulting bird will not have the same measurements as a laying hen. On handling the bird, first its weight should be noted. A good producer will be lean, but not light. Exceptionally light birds should be rejected.

SELECTION CHART.

In this chart the chief differences between the body characters of good and poor layers are so arranged that the flock owner can determine the production value of his birds.

PRESENT PRODUCTION.

(Applied at any season of the year to distinguish between laying birds and those that are resting.)

<i>Laying.</i>	<i>Character.</i>	<i>Not Laying.</i>
Large, red waxy	COMB	Shrivelled, pale, scaly
Soft, smooth	WATTLES AND EARLOBES	Rough, dry
Large, oval, moist, bleached	VENT	Small, puckered, dry, and yellow
Wide apart	PUBIC BONES	Close together

PAST PRODUCTION.

(These differences are more apparent in the later summer months.)

<i>Good Layer.</i>	<i>Character.</i>	<i>Poor Layer.</i>
Bleached, bluish-white	VENT	Yellow pigment present
Thin, bleached	EYE RING	Thick, yellow pigment
Completely bleached	BEAK	Yellow or becoming yellow
Bleached	SHANKS	Yellow
Late, after 1st March	MOULT	Early, before 1st March
Worn, soiled	PLUMAGE	Fresh, oily
Seldom or never	BROODINESS	Often

RATE OF PRODUCTION.

<i>High Rate.</i>	<i>Character.</i>	<i>Low Rate</i>
Thin, flexible	PUBIC BONES	Thick, rigid
Soft, free from heavy fatty deposits	ABDOMEN	Hard, fatty
3 or 4 fingers	CAPACITY	2 fingers
Thin, soft, loose	SKIN	Thick, hard, dry, and tight
Parallel with back and sloping downward	KEEL	Sloping upward

ABILITY TO LAY.

(For use in selection of pullets or hens.)

<i>Good Layer.</i>	<i>Character.</i>	<i>Poor Layer.</i>
High vitality	HEALTH	Low vitality
Alert, friendly, active	TEMPERAMENT	Dull, listless, wild
Wide, level, comparatively long	BACK	Narrow, tapering
Wide	RUMP	Sloping
Moderately deep	DEPTH	Shallow
Full, well-sprung ribs	BREAST	Tucked-up, narrow
Fine, lean, clean cut	HEAD	Coarse, shallow, long and narrow
Large, bright, bulging, full	EYES	Small, dull, sunken
Short, stout	BEAK	Long, thin
Close	PLUMAGE	Loose
Flat bone	SHANKS	Round

HEALTH AND VIGOUR.

<i>High.</i>	<i>Character.</i>	<i>Low.</i>
Broad, deep	HEAD	Long, slim, crow
Bright, prominent	EYES	Dull, sunken
Long, moderately deep	BODY	Short, shallow
Strong, parallel	LEGS	Spindly, knock-kneed
Stylish, upright	CARRIAGE	Droopy
Active	DISPOSITION	Sluggish

EXTENSION SERVICE—VALUE OF PERSONAL CONTACT.

The United States has been divided into 257,000 neighbourhoods, in which leaders have been appointed or elected. The neighbourhoods have not been formed primarily for rural purposes, and they include urban dwellers. This organisation has already been active in such projects as the collection of scrap metal and rubber, cost-of-living surveys, food for freedom, fire control, war stamps, farm labour and farm machinery repair.

Interesting data are available showing the effects of intimate contact with farmers by neighbourhood leaders. Different responses to requests to take part in salvage programmes and "to order fertilizer early" were noted, according to the methods of disseminating information.

The following table shows the percentage of families contacted which responded to requests according to the method of approach adopted:—

Method Used.	Campaign Objective		Effect of Personal Contact.
	Scrap Collections.	"Order Fertilizer Early."	
1. Neighbourhood leader contact and other methods	79%	80%	With personal contact 75%
2. Neighbourhood leader alone ..	67%	75%	
3. Other methods alone	48%	25%	Without personal contact 33%
4. Not contacted	30%	30%	

This information indicates the need for decentralisation of activities designed to encourage practices which are new to farmers. The importance of personal contact is well shown.—*Extension Service Review* (U.S.A.).

Agricultural Chemistry

Arsenic and its Dangers.

W. R. WINKS.

EVERY year Queensland suffers stock losses, many of which could be avoided if stockowners realised how poisonous arsenic is and for how long it persists. Arsenic, the metal or rather the metalloid, is seldom or never seen as such, but various arsenical compounds are used extensively in agricultural, horticultural and pastoral enterprises.

The commonest form in which arsenic is known is white arsenic (arsenic trioxide). Queensland legislation requires poisonous substances to be coloured, so a small quantity of lamp-black is mixed with "white" arsenic to give the "grey" arsenic of commerce. White or grey arsenic is the active constituent of cattle dips and of many weedkillers. It is usually dissolved in either caustic or washing soda to form sodium arsenite.

Being a mineral, arsenic is not readily destroyed and it can remain in the soil for many years. The following example is evidence of the persistent danger from arsenic: A dip was emptied and the fluid run into a nearby depression. The owner, realising that the fluid could be dangerous, fenced off the depression with a sapling fence. Some years later, dairy cows which were being driven to water passed the depression which had collected storm water, and, being thirsty, broke through the fence to drink. A heavy mortality resulted.

Another form in which arsenic is available is arsenic pentoxide. This was first used in quantity for the destruction of prickly pear, but nowadays it is used in the destruction of trees and as a weedicide. Unlike white arsenic which is only sparingly soluble, arsenic pentoxide dissolves readily in water.

When either arsenic pentoxide or sodium arsenite is used for the destruction of timber or weeds, stock should be denied access to the poisoned paddocks until after a good burn and heavy rains, when luxuriant regrowth has become established. The smoke from burning vegetation, which has been killed with arsenical sprays, is dangerous to mankind and should be avoided as much as possible when such material is being burnt, particularly in heaps. Timber which has been poisoned with arsenic against attacks by white ants can also cause sickness, and even death, if burnt in a stove in an ill-ventilated room.

Cattle suffering from mineral deficiencies sometimes lick the white incrustation found on the earth or stone of the dip drip yard and deaths from this cause have come under the notice of departmental officers.

Arsenic solutions can often cause serious injuries to the body if allowed to come into contact with it, and injuries to the finger nails quite commonly follow the immersion of the hands in such solutions.

Other common arsenic compounds chiefly used as pest destroyers are arsenate of lead; calcium arsenate, a compound of calcium (lime) and arsenic; and Paris green, a compound of copper and arsenic. The chief danger from these compounds is to domestic pets and to fowls. The common baits formed from one or other of these compounds, bran, pollard and molasses and used for the destruction of grasshoppers, cut worms, and other pests, are quite attractive to fowls and even to cats and dogs. It will kill them as readily as it does insect pests and the greatest care should be exercised in distributing such baits. All arsenical preparations should be kept well out of the way of children, and older people should always exercise care by washing the hands before eating food, or even rolling cigarettes, after arsenical preparations have been handled.

The foregoing indicates that, although arsenic is one of the most efficient pest destroyers available at the present time, it may also be a menace if due care and precautions are not taken to ensure that animals cannot have either direct or indirect access to it.

WHITE HIDE.

Following is a method of making white hide by applying the alum "tanning" process:—

(1) Soak the hide in clean water for four hours, then run off the dirty water and cover with clean water; leave for twenty-four hours. This should be sufficient for fresh or salted hides. Dry hides should be soaked for a further twenty-four hours, or until they are soft.

(2) Remove the hair by soaking hides in milk of lime—30 lb. lime per 100 gallons water. Handle each day, and leave until the hair can be removed—about six to seven days in summer.

(3) Remove all flesh and fat by scraping with a knife. Wash well with several lots of water during the twenty-four hours after removing the hair and pieces of flesh, fat, &c.

(4) Tan in a solution of alum (5 lb.), salt (1½ lb.), Glauber salt (1½ lb.), and water (10 gallons). Use enough of the solution to cover the hides. Handle twice daily and allow six days for tanning.

(5) Drain well from the alum and salt solution, but do not wash; then cover both sides with fish oil or neatsfoot oil, and hang up and allow to dry slowly. Tanners have a machine for forcing the oil fats, &c., into the hide.

(6) When dry, stretch until soft. If dry skins are difficult to stretch, sprinkle with water and cover for two days; again stretch and dry.

Alum-tanned leather is sometimes covered with a paste instead of oil before drying. The paste is made up as follows:—

- 5 lb. flour.
- 2½ lb. alum.
- 1 lb. salt.
- 1 lb. neatsfoot oil.
- 1 to 1½ gallons water.

Mix the alum and salt with water and then the flour and oil in a separate basin. Add to the flour and oil sufficient of the alum and salt solution to make a paste. Put the hide and paste into a tub, and handle the hide vigorously so as to force the paste into the leather. Hang the leather up and allow it to dry slowly without removing the paste. If the leather is too firm, rub on more fat, such as soft dripping, &c. If possible, stretch the leather just before it is quite dry. After stretching, it can be nailed on a wall or similar surface.

GENERAL NOTES

Staff Changes and Appointments.

The following transfers of Instructors in Agriculture have been approved:—

Mr. W. R. Straughan, from Chinchilla to Warwick;

Mr. G. W. Smith, from Toowoomba to Chinchilla; and

Mr. E. R. Ashburn, from Gatton to Laidley.

Commodity Marketing Boards.

An Order in Council issued under *The Fruit Marketing Organisation Acts* extends the operation of the provisions of those *Acts* for a period of five years from 1st January, 1945, to 31st December, 1949. This, in effect, means that the operations of the Committee of Direction of Fruit Marketing are extended for the period mentioned.

Mr. H. S. Hunter, Director of Marketing, has been appointed a member of the Committee of Direction of Fruit Marketing until 31st August, 1946.

An *Order in Council* has been approved giving notice of intention to extend the operations of the Queensland Egg Board for a further period of three years from 1st January, 1945.

Cheese Board.

The following have been nominated for appointment as members of the Cheese Board:—

Messrs. R. T. Dare (Narko), R. C. Duncan (Pittsworth), M. McIntyre (Mt. Tyson), D. G. O'Shea (Southbrook).

An election, closing at 12 noon will be held on 6th December, 1944. Three members are required.

Butter Board.

The following have been nominated for appointment as members of the Butter Board:—

Messrs. A. H. Bulow (Mulgeldie), S. H. Cleminson (Malanda), J. McRobert (Maryborough), A. G. Muller (Boonah), T. F. Plunkett (Beau-desert), J. Purcell (Toowoomba), W. J. Sloan (Malanda).

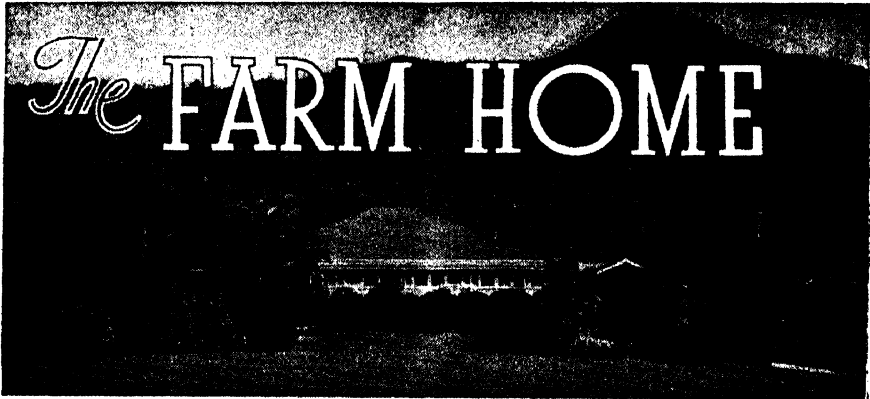
An election, closing at 5 p.m., will be held on 6th December, 1944. Six members are required.

Sugar-mill Technology Scholarships.

The Minister for Agriculture and Stock (Mr. T. L. Williams) has announced a decision of the Government to grant two scholarships in sugar-mill technology, open to undergraduates who have completed at least one year in the School of Applied Science in Industrial Chemistry at the Queensland University. The Minister stated that the Sugar Advisory Board viewed with concern the depletion of the staff of the Technology Division of the Bureau of Sugar Experiment Stations, because, primarily, of the diversion of some members of the staff to other industries. It is proposed that, on the completion of the prescribed course of study and graduation, each scholarship-holder shall serve a specified period of years in the Public Service of the State.

Buffalo Fly Control.

The Minister for Agriculture and Stock (Mr. T. L. Williams) has announced that a regulation has been promulgated under *The Diseases in Stock Acts* prohibiting the carrying, collection, keeping or sending through the Post Office or otherwise of buffalo flies or eggs of buffalo flies. Hitherto, this prohibition only extended to the cattle tick or eggs of the tick, but in view of the necessity to do everything practicable to prevent an extension of the buffalo fly pest, it has now been decided to apply the penalty clauses of *The Diseases in Stock Acts* to the unauthorised carriage of the fly.



The FARM HOME

Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE CARE OF BABY'S SKIN.

IN last month's article it was pointed out that the baby's skin is extremely sensitive and the special care needed to protect it was outlined. However, it is sometimes necessary to treat skin irritations which have already occurred as a result of lack of knowledge or care, or because the baby's skin is even more than usually delicate. A few of the common skin irritations are:—

Cradle Cap.—The skin on the top of the head is called the scalp and sometimes in very young babies a condition known as cradle cap occurs. This appears as bran-like patches on the scalp and may spread to the forehead and eyebrows. It should be treated as soon as it is noticed, because otherwise it may be difficult to remove. To guard against cradle cap, before the baby's bath each day apply a little warm "baby oil" or castor oil to his scalp and then wash with super-fatted soap. The scalp should be gently rubbed with a soapy hand, and the soap should be washed off carefully before drying with a soft towel. Mothers are usually afraid to touch the "soft spot" on the baby's head, but they can do no harm if they wash and dry the head gently.

If a scurfy patch is observed, remove it by rubbing it gently with the tips of the fingers smeared with a little vaseline. Leave on for some hours and then gently lift the scales with a visiting card; then wash the head with warm water and baking soda (1 teaspoon to 1 pint of water).

Chafing.—This condition occurs in the creases where two skin surfaces come into contact. The skin becomes red and moist and a discharge may occur. The parts generally affected are the creases behind the ears, and the creases of the neck, the armpits, the elbows, thighs and buttocks. To prevent the condition, the baby should be gently soaped all over, particularly in the creases, using a super-fatted soap. After thoroughly washing off the soap, dry the skin very carefully. It is wiser not to use powder in the creases—a thin film of baby oil is preferable.

Napkin Rash.—The area of the skin covered by the napkin may be reddened, because of irritation caused by a wet napkin or after the baby has had a bowel upset. If the baby does not have sufficient cool boiled water in hot weather, the urine becomes concentrated and irritates the skin. Wet and soiled napkins should be removed as soon as possible, and the napkins themselves should be soaked well and then boiled. Never use soda, blue, or soap powders in washing napkins, and see that they are well rinsed and thoroughly dried and aired before use.

Sunburn.—All babies require sunbaths daily, but they should be given very carefully, commencing with one or two minutes on the legs and gradually increasing as the baby becomes tanned. If the baby is exposed too long to the direct rays of the sun, his skin may be badly burned. Sunburn can be just as painful and dangerous as a burn from any other cause, and mothers should be most careful to avoid it. If it does occur in mild degree, apply a little zinc cream or boracic ointment.

Chapped face, hands, or legs.—This usually occurs in cold windy weather and, although not serious, is uncomfortable and cracks in the lips may interfere with suckling. It is a good plan to rub a little good lanoline or cold cream on his face and other exposed parts before taking the baby out on a windy day.

Insect bites.—Bites of mosquitoes, sandflies, fleas, and other insects may cause a rash which may be recognised by the presence of a darker puncture in the centre of each spot. For the irritation, apply a paste made of baking soda and water.

Many common skin conditions of childhood are preventable with proper care. Except where the cause is known and the rash responds to simple treatment, the advice of a doctor should be sought.

Questions on this or any other subject concerning Maternal and Child Welfare will be answered by communicating personally with *The Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

Some Unusual Recipes.

In present circumstances, recommendations are subject, of course, to the availability of the ingredients mentioned or of suitable substitutes.

Vegetable and Meat Cakes.

One cup each of cooked mashed potatoes and carrots, 3 or 4 oz. fresh minced meat, 1 tablespoon finely chopped parsley, a little chopped onion if available, pepper and salt, about 1 tablespoon thick sauce. Combine vegetables, meat, parsley, and seasoning and bind together with the sauce if required. Turn on to a floured board and form into flat cakes, dust with flour, and fry in a little smoking-hot fat until lightly browned on the under side; turn and fry on the other side, allowing 12 to 15 minutes' frying in all to cook the meat. Drain and dish the cakes on a bed of green vegetables, with a little brown sauce made from the vegetable stock poured round them. These cakes can be brushed with milk and baked for 20 minutes in a hot oven if preferred.

Canteen Cookies.

Half teacup syrup or treacle, 2 tablespoons milk, 1 teacup rolled oats, $\frac{1}{2}$ teaspoon baking soda, 1 teacup flour, 4 tablespoons sugar, $\frac{1}{2}$ teaspoon salt, 1 teaspoon ground ginger, 3 tablespoons bacon fat or butter.

Heat the syrup or treacle with the sugar, fat, and milk in a saucepan till the fat is dissolved. Sift the flour with the salt, soda, and ginger; then add alternately with the rolled oats to the fat mixture. Cool. Turn on to a well-floured pastry board. Roll out and cut into small rounds. Bake on greased baking sheet, a little apart, in a moderate oven (Regulo 3) till pale-brown. Cool on wire rack. Store in a tightly closed jar.

These biscuits are handy to serve with coffee or tea or to include in a packed luncheon.

Devilled Mutton.

Cut some slices of cold mutton or lamb, sprinkle them with salt, pepper, and cayenne and a few drops of unsweetened lemon flavouring. Leave for half an hour, then dip in melted butter, coat lightly with browned breadcrumbs, and bake for about ten minutes in a moderate oven.

Escalloped Parsnips.

Cook some parsnips until tender, then dice them quite finely. Put into a dish alternate layers of parsnips and breadcrumbs and butter, salting to taste. Continue until the dish is full, having breadcrumbs and butter on top. Pour over a little milk and bake until brown. Serve in the baking dish.

Girdle Scones.

Rub well together 1 lb. flour, 1 teaspoon bicarbonate soda, 2 teaspoons cream of tartar, 2 teaspoons sugar, and pinch of salt. Rub in a piece of butter the size of a walnut, mix with milk to soft dough, roll out about $\frac{1}{4}$ -in. thick, and cut into triangles. Dust hot girdle with flour and cook slowly on both sides.

Cracked Wheat as a Vegetable.

Use threshed wheat for this.—A cupful will be enough to serve four people. Soak overnight in boiling water and then crack by pressing with a potato-masher or rolling with a rolling-pin. Boil until tender with just enough water for it to absorb slowly. Add salt, pepper, and butter to taste, turn into a covered casserole, pour over a little milk, and bake slowly for half an hour. Serve as an ordinary cereal vegetable.

Egg Noodles.

Sift 8 oz. flour with $\frac{1}{2}$ teaspoon of salt, add 2 egg yolks and a tablespoon of melted butter, and work into a stiff—but smooth—dough. Knead well, roll out, and cut in several portions (say, six); fold lengthwise and cut crossways into narrow strips. Loosen the strips and boil in salted water. Drain and place in saucepan with 1 oz. butter, 1 oz. grated cheese, and 2 tablespoons of sauce and season with pepper and grated nutmeg. Stir over the fire till thoroughly heated, dish up, sprinkle with freshly fried breadcrumbs, and serve.

Savoury Roll.

Take 8 oz. flour, pinch salt, water, 4 oz. finely shredded suet. For the filling, 8 oz. minced raw steak, 2 tablespoons finely diced onion, 2 tablespoons finely diced potato, 1 tablespoon finely chopped parsley, 1 teaspoon finely chopped mixed herbs, salt, pepper, milk.

Mix the ingredients for the filling all together in a bowl. Season generously with salt and pepper and moisten with a little milk, sufficient only to bind the mixture. It should not be sloppy. Sift the flour and salt into a bowl. Rub in the suet lightly and then mix with sufficient water to a firm dough. Roll out in an oblong about half as long again as it is broad. Spread the filling over and roll up the paste. Damp the last edge to make it adhere firmly and press the ends to close them. Put into a dry, well-floured cloth and roll up. Tie securely, leaving just a little room for it to swell. Plunge into a pan with sufficient fast boiling water to cover the roll. Keep the water boiling fairly fast during cooking and replenish with boiling water if it boils away. Cook for two hours. Serve with gravy.

Vegetable Pie.

Into a piedish put left-over cooked vegetables, cutting them neatly into dice. Potatoes, carrots, peas, turnips are all suitable. Make a cup of white sauce, season it well with pepper, salt, and chopped parsley, pour it over the vegetables and finally cover it with a layer of grated cheese and breadcrumbs in equal quantity. Then brown in the oven and serve hot.

Egg Roly-poly.

Six tablespoons self-raising flour, 2 or 3 hard-boiled eggs, 1 onion, salt, cold water, 3 tablespoons shredded suet. Mix flour with shredded suet and salt, mix to a dough with cold water and roll out as for roly-poly. Slice 1 onion thinly, spread eggs (cut in slices) over surface of paste, and place onions on top. Sprinkle well with salt and pepper, roll carefully, sealing edges well, place in scalded and floured pudding cloth, and boil two hours.

Green Pea Omelette.

Put $\frac{1}{2}$ lb. shelled peas through mincer, add a grated onion, little chopped parsley, herbs. Season with salt and pepper. Beat an egg, mix with a cup milk, and pour over peas. Bake until set.

RAINFALL IN THE AGRICULTURAL DISTRICTS.**AUGUST RAINFALL.***(Compiled from Telegraphic Reports).*

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Aug.	No. of years' records.	Aug., 1944.	Aug., 1943.		Aug.	No. of years' records.	Aug., 1944.	Aug., 1943.
<i>North Coast.</i>	In.		In.	In.	<i>South Coast—contd.</i>	In.		In.	In.
Atherton	0.84	42	1.12	..	Gatton College	1.08	44	1.79	1.64
Cairns	1.65	61	1.28	0.03	Gayndah	1.12	72	1.29	0.90
Cardwell	1.22	71	1.73	0.24	Gympie	1.65	73	1.26	1.47
Cooktown	1.17	67	0.54	..	Kilkivan	1.35	62	0.66	0.80
Herberton	0.61	57	0.47	..	Maryborough	1.61	72	1.48	0.69
Ingham	1.44	51	1.94	0.13	Nambour	1.88	47	1.80	2.05
Innisfail	4.85	62	6.24	0.32	Nanango	1.29	61	0.78	1.34
Mossman	1.34	19	1.14	0.37	Rockhampton	0.82	72	0.90	0.78
Townsville	0.50	72	0.60	0.11	Woodford	1.61	55	1.62	1.54
<i>Central Coast.</i>					<i>Central Highlands.</i>				
Ayr	0.58	56	0.66	..	Clermont	0.70	72	0.89	0.25
Bowen	0.72	72	0.58	..	Springsure	0.99	74	0.46	1.02
Charters Towers	0.50	61	1.13	..	<i>Darling Downs.</i>				
Mackay	1.09	72	0.74	0.07	Dalby	1.16	73	1.90	1.83
Proserpine	1.45	40	2.76	0.01	Emu Vale	1.06	47	2.74	2.95
St. Lawrence	0.79	72	1.12	0.27	Jimbour	1.10	64	2.01	1.64
<i>South Coast.</i>					Miles	1.08	58	2.01	1.85
Biggenden	1.04	44	0.93	0.55	Stanthorpe	1.73	70	1.95	3.76
Bundaberg	1.27	60	1.61	1.01	Toowoomba	1.58	71	3.24	1.98
Brisbane	1.90	91	2.51	1.42	Warwick	1.40	78	3.65	3.51
Caboolture	1.62	67	1.63	1.05	<i>Maranoa.</i>				
Childers	1.21	48	0.96	0.88	St. George	0.91	62	2.86	1.86
Cromahurst	2.17	50	1.77	1.70	Roma	0.86	69	2.74	1.57
Esk	1.39	56	1.58	1.18					

CLIMATOLOGICAL TABLE FOR AUGUST.*Compiled from Telegraphic Reports.*

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	SHADE TEMPERATURE.		EXTREMES OF SHADE TEMPERATURE.				RAINFALL.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
<i>Coastal.</i>	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns .. ..	..	78	52	84	27, 28	51	28	128	11
Herberton .. ..	..	71	50	82	26, 27	37	28	47	6
Townsville .. ..	..	77	57	87	27	49	12, 13	60	4
Brisbane	30.16	71	51	84	30	46	5	251	7
<i>Darling Downs.</i>									
Dalby .. ..	..	69	42	83	31	34	2	190	6
Stanthorpe .. ..	..	61	37	73	31	24	1	195	5
Toowoomba .. ..	..	62	45	76	31	40	4	324	8
<i>Mid-Interior.</i>									
Georgetown	30.03	84	55	89	31	43	15	139	1
Longreach	30.16	80	50	92	31	40	12	9	1
Mitchell	30.20	68	42	83	30	31	3	317	8
<i>Western.</i>									
Burketown .. ..	..	85	56	91	27	50	11, 12, 13	..	..
Boulia	30.10	79	48	95	31	34	10	..	..
Thargomindah	30.16	70	47	89	31	35	3	248	3

A. S. RICHARDS, Divisional Meteorologist.Commonwealth of Australia,
Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

OCTOBER, 1944.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			CORRECTION IN MINUTES FOR OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
1	5.29	5.47	Cairns ..	+ 37	+ 20	Longreach ..	+ 39	+ 31
6	5.23	5.49	Charleville ..	+ 28	+ 27	Quilpie ..	+ 34	+ 36
11	5.18	5.52	Cloncurry ..	+ 56	+ 44	Rockhampton ..	+ 14	+ 6
16	5.13	5.55	Cunnamulla ..	+ 29	+ 30	Roma ..	+ 18	+ 16
21	5.07	5.58	Dirranbandi ..	+ 18	+ 20	Townsville ..	+ 31	+ 18
26	5.03	6.01	Emerald ..	+ 23	+ 16	Winton ..	+ 44	+ 35
31	5.00	6.04	Hughenden ..	+ 41	+ 30	Warwick ..	+ 4	+ 4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.			CORRECTION IN MINUTES FOR SOUTHERN DISTRICTS.					
			Charleville + 27; Cunnamulla + 29; Dirranbandi + 19; Quilpie + 35; Roma + 17; Warwick + 4.					
			CORRECTIONS IN MINUTES FOR CENTRAL DISTRICT.					
Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	p.m.	a.m.						
2	4.45	4.48						
3	5.53	5.31						
4	7.01	6.13						
5	8.07	6.56						
6	9.12	7.39						
7	10.15	8.25						
8	11.15	9.13						
9	a.m.	10.03						
10	12.11	10.56						
	1.01	11.49						
11	p.m.	12.43						
12	1.47	1.36						
13	2.29	1.36						
14	3.07	2.29						
15	3.42	3.21						
16	4.14	4.12						
17	4.46	5.03						
18	5.18	5.55						
19	5.51	6.47						
20	6.25	7.41						
21	7.02	8.36						
22	7.43	9.32						
23	8.28	10.29						
24	9.18	11.24						
25	10.13	..						
	a.m.	12.17						
26	11.12	1.08						
27	p.m.	1.55						
28	12.14	2.40						
29	1.19	3.22						
30	2.24	4.03						
31	3.31	4.45						
	5.43	4.45						
			CORRECTIONS IN MINUTES FOR NORTHERN DISTRICTS.					
Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 34	+ 20	+ 53	+ 44	+ 39	+ 29	+ 29	+ 18
2	+ 23	+ 32	+ 46	+ 56	+ 32	+ 37	+ 21	+ 27
3	+ 15	+ 40	+ 40	+ 58	+ 27	+ 42	+ 14	+ 35
4	+ 10	+ 47	+ 37	+ 62	+ 23	+ 47	+ 10	+ 40
5	+ 9	+ 49	+ 36	+ 63	+ 22	+ 48	+ 8	+ 41
6	+ 11	+ 46	+ 38	+ 62	+ 23	+ 47	+ 10	+ 39
7	+ 16	+ 40	+ 41	+ 58	+ 27	+ 42	+ 14	+ 35
8	+ 23	+ 33	+ 46	+ 54	+ 32	+ 38	+ 21	+ 28
9	+ 31	+ 24	+ 52	+ 46	+ 37	+ 32	+ 27	+ 21
10	+ 39	+ 17	+ 56	+ 42	+ 42	+ 28	+ 34	+ 15
11	+ 45	+ 10	+ 61	+ 37	+ 46	+ 23	+ 38	+ 10
12	+ 50	+ 8	+ 64	+ 36	+ 48	+ 22	+ 41	+ 8
13	+ 49	+ 9	+ 64	+ 36	+ 47	+ 23	+ 39	+ 10
14	+ 42	+ 14	+ 59	+ 40	+ 44	+ 26	+ 36	+ 14
15	+ 31	+ 23	+ 52	+ 46	+ 37	+ 32	+ 27	+ 21
16	+ 22	+ 34	+ 45	+ 54	+ 30	+ 38	+ 19	+ 29

NOTE.—The plus sign (+) means later than Brisbane time.

PHASES OF THE MOON.

Full Moon, 2nd October, 2.22 p.m.; Last Quarter, 9th October, 11.12 a.m.; Full Moon, 31st October, 11.35 p.m.; New Moon, 17th October, 3.35 p.m.; First Quarter, 25th October, 8.48 a.m.

DISCUSSION.

On 20th October the Sun will rise 10 degrees south of true east and set 10 degrees south of true west.

On 16th October the Moon will rise and set at the true east and west points respectively.

Venus.—The planet this month is observable in the west during the early evening. At the beginning of the month it passes from the constellation of Virgo into the constellation of Libra, setting throughout Queensland generally, about 8 p.m., approximately 15 degrees south of true west. By the end of the month it comes very close to Antares, that brilliant star at the head of the Scorpion; and sets, in Queensland generally, before 9 o'clock, 25 degrees south of true west.

Mars.—During the month Mars is too near in line with the Sun for observation. It sets generally about 6.30 p.m.

Jupiter.—This planet will be conspicuous during the early morning, in the east, in the constellation of Leo. At the beginning of the month it rises in Queensland generally about 5 a.m., but by the middle of the month it rises soon after 4 p.m. (western towns later), approximately 5 degrees north of true east. At the end of the month Jupiter rises in Queensland between 2.45 and 3.30 a.m., the direction of rising then being still about 5 degrees north of true east.

Saturn.—During the month Saturn rises near midnight in the constellation of Gemini, about 25 degrees north of true east.

Direction from Heavenly Bodies.—Since the outbreak of this war much has been heard of the value of being able to find direction from the Sun, Moon, Planets, and Stars without instruments or calculations. While these methods are usually very simple, it is just as simple to be badly misled and to make serious errors, unless the scope of the particular rule is understood. These easy rules are based on some general condition, or circumstances applicable to a particular zone, and how imperative it is to know the limits wherein the rule holds is shown by the following: It is widely known that the stars of Orion's belt always rise true east and set true west. These directions hold good for any position of the observer on this earth, *but it is only when these stars are on the horizon is it so.* As they appear higher up in the sky, their direction changes and the amount of change in a given time now depends on the position on earth of the observer. From a place in Latitude 10 degrees south (Thursday Island), three hours after rising the direction of the belt is 10 degrees north of the true east point; and from a place in Latitude 30 degrees south (Grafton), three hours after rising the direction of the belt is 27 degrees north of true east. It will be seen then that, for a general rule, the direction is limited to when the bodies appear on the horizon and the closer the observation is made to that instant the more accurate will be the result. Furthermore, when the Star, Sun, or Planet does not rise true east or set true west, then the angle north or south of the true east or west again depends on the position of the observer. The further from the equator, the greater is the angle—e.g., the Sun on 23rd December at Thursday Island rises 23½ degrees south of true east; at Sydney on the same date rises 28 degrees south of true east; and at Grafton on the same date rise 26½ degrees south of true east.

To the average person concerned with direction, however, a standard of accuracy not greater than about 5 degrees is required, and fortunately for Queenslanders it is well within this limit to assume that from any place in this State, the direction up to one hour after rising to one hour before setting is the same as that given for rising and setting. There are even times when, for places in Northern Queensland, the direction of the Sun, Moon, and Planets changes very little from rising till they pass into the western sky, and then changes very little again before setting, but this is confined to a certain place on a certain date and is not general throughout the State, as in the limit of one hour from rising and setting.

Frequent mention has been made this month of the direction at rising and setting of the Sun, Moon, and Planets, and, while this information is of great value, the above warning not to go beyond the limit of the scope of the rule should be carefully noted. The Sun and Moon are easily seen on the horizon and not much difficulty should be experienced in noting the planets very close to the horizon.

Supplied by the Astronomical Society of Queensland.

QUEENSLAND WEATHER IN SEPTEMBER.

Some light showers in the far North Coast and North Peninsula sections gave over-average monthly totals. Mainly because of a fairly general storm distribution just after the middle of the month, figures for the Maranoa, Darling Downs, and South Coast Moreton districts were only slightly under to a little above normal. Favourable conditions were maintained in most other agricultural and dairying sections, chiefly because of the earlier rains of inland tropical source. There has been a marked seasonal absence of any rain influences from southern disturbances. Apart from a few unimportant light over-average showers in the Lower West, little or no rain fell over the greater part of inland pastoral areas. Light September rains are usual, but the early advent of the variable inland storms of October and November would assist the main pastoral districts still in average seasonal condition and be welcomed in southern border areas where August rains were insufficient to maintain proper pasture growth. Further storms on the Darling Downs, however, might reduce the estimated wheat crop of 6,000,000 bushels by hail or rust damage.

Temperatures.—Maximum temperatures were above normal in western districts from 1.6 degrees at Longreach to 2.1 degrees Boulia, otherwise coastal and south-east sections were below normal from 2.6 degrees at Rockhampton and Mitchell to 3.4 degrees Brisbane (record).

Stanthorpe lowest minima (12th), 27 degrees and 20 degrees.

Mitchell Screen 33 degrees (18th), Terrestrial 28 degrees 11/12th.

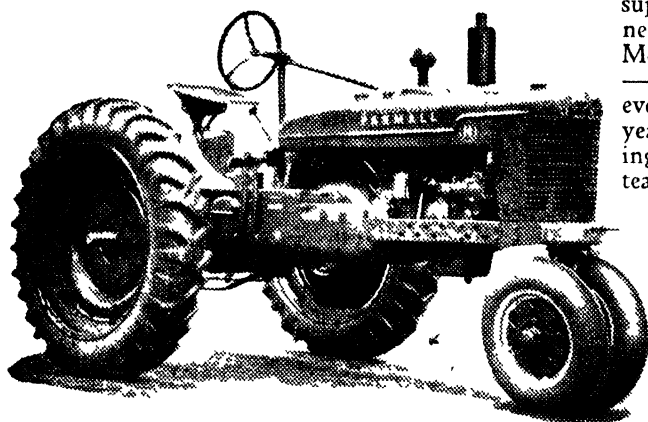
The rain position is summarised below—

Division.	Normal Mean.	Mean Sept., 1944.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	13	37	185 above
Peninsula South	24	Nil	100 below
Lower Carpentaria	17	Nil	100 "
Upper Carpentaria	36	Nil	100 "
North Coast, Barron	92	253	175 above
North Coast, Herbert	155	193	25 "
Central Coast, East	108	30	72 below
Central Coast, West	70	Nil	100 "
Central Highlands	102	32	69 "
Central Lowlands	65	7	89 "
Upper Western	29	13	55 "
Lower Western	44	28	36 "
South Coast, Port Curtis	141	81	43 "
South Coast, Moreton	206	176	15 "
Darling Downs East	167	161	4 "
Darling Downs West	104	125	20 above
Maranoa	118	112	5 below
Warrego	88	14	84 "
Far South-West	56	5	91 "

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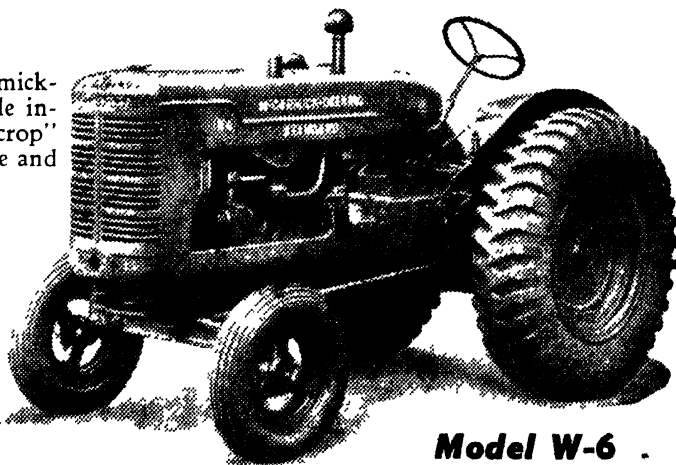


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QUEENSLAND AGRICULTURAL JOURNAL

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NOVEMBER, 1944

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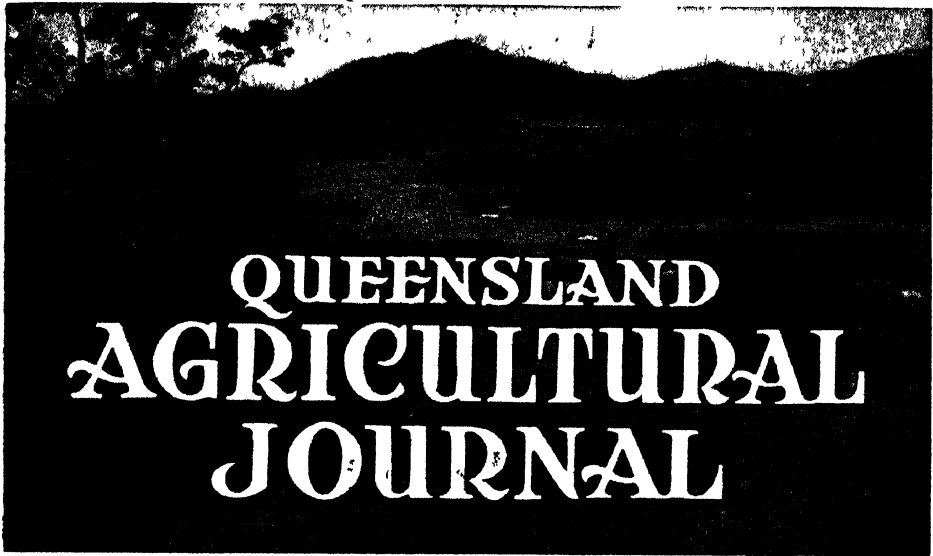
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Volume 59

1 NOVEMBER, 1944

Part 5

Event and Comment.

Butter for Britain—Four-year Contract for Australian Producers.

UNDER a long-term arrangement with the British Government, Australian producers are now assured of markets for meat and dairy products at good prices for four years. This arrangement will continue until 1948, and its terms provide that during the period of its currency Britain will take the whole of Australia's exportable surplus of dairy produce and other specified foodstuffs. This notable contract, therefore, ensures for the Australian producer a guaranteed market and a guaranteed price for those foodstuffs. The exportable surplus will be declared after providing for Australian Services and civil population, and for British, United States and other Allied personnel based on Australia, as well as for other markets as agreed to mutually by the Commonwealth and British Governments.

For Australian producers, this four-year contract constitutes a marketing landmark; it provides an assured outlet for all our meat and dairy products on a price basis which ensures long-range stability for the industries concerned. As Britain was our best overseas customer before the war, so Britain continues as one of our best wartime customers. Naturally, the chief reason for this arrangement is the impetus it is expected to give to an increased output of primary products needed so urgently to feed a hungry world.

One of the present pressing national needs is a big increase in dairy production. With the knowledge that every pound of butter, every pound of cheese and every container of processed milk they can produce will be sold at a satisfactory price, Queensland dairy farmers will realise that their industry will be protected on the one hand, and, on

the other, that they will add to their already splendid contribution towards the winning of the war. The need is urgent; Commonwealth commitments must be met; and our contribution to the food needs of the United Nations must be continued.

The arrangement between the two Governments concerned will operate for a period of four years as from 1st October, 1944, to 30th September, 1948, for meat; and from 1st July, 1944, to 30th June, 1948, for dairy produce. Briefly, the arrangement is based on the desire of the British Government that Australia should maintain and increase, if possible, the production of meat and dairy foodstuffs in order to ensure supplies which are, and will continue to be, urgently needed; and on the desire of the Commonwealth Government to assist to this end by making available for export to Britain during the period of this arrangement, the surplus of the products mentioned after provision is made for—

Home requirements, including Australian Services;

Supplies which Australia is required to make available to British, United States and other Allied personnel based on Australia;

Quantity which the Australian Government may provide relief requirements after consultation and agreement with the British Government; and

Quantities which the two Governments mutually agree shall be supplied to other markets.

The important point for Australian producers is that they are now assured of markets for their meat and dairy products for the four years during which the arrangement will operate.

The surplus production of all classes of meat—beef, mutton, lamb, pigmeats and offals come within the scope of the arrangement, but in the case of pigmeats further discussions will take place, well before the beginning of the last two years of the arrangement, to determine the maximum quantities which Britain will take during those two years, namely, from 1st October, 1946, to 30th September, 1948. It will thus be possible for the Commonwealth Government to give adequate notice to pig raisers of any material alterations in the pigmeat plan, which will continue to operate in its present form until 30th September, 1946.

In respect of dairy products, the arrangement represents a further major advance towards the objective of ensuring for producers a lengthy term of market stability.

In the course of a statement in regard to this arrangement in the House of Representatives recently, the Prime Minister (Right Hon. John Curtin) said: "I am very happy to say that the Government of the United Kingdom has been able not only to understand the problems of this country, but also to have regard for our interests. In a similar way it has treated the Government and people of New Zealand. I have often expressed our admiration of the people of the United Kingdom for their fighting spirit and their valorous resistance to the Nazis, but I also place on record our appreciation of the treatment which they have given to the Dominions, particularly in respect of the prices that they have paid to us for our exports."

Field Crops

Soy Bean.

C. J. McKEON.

ALTHOUGH the soy bean is not a recent introduction to Queensland, it is only within the past few years that it has shown promise of becoming a useful crop in this State. A native of the Orient, it has been an important food crop in Manchukuo, China, and Japan for many centuries, and a large peacetime export trade in soy bean and soy bean products has been developed, particularly from the first-mentioned country. The success achieved with the crop in the United States of America over the past decade has stimulated interest in its possibilities in Queensland. Experience in America and elsewhere indicated, however, that no single variety of soy bean is adapted to a wide range of soil and climatic conditions, and it is accordingly necessary for extensive tests of varieties to be carried out in the major agricultural districts in order to determine the most suitable varieties for each particular area. Variety tests have been made in several districts, but it is likely to be some years yet before definite results are obtained. The prospects of ultimately establishing soy bean production on a stable basis in some districts, however, warrant further trials.

The soy bean has a wide variety of uses, and may be grown for bean production, green manure, grazing, green fodder, hay, and silage. The beans are widely used in the green form for salads and canning, and the dried bean is used as a vegetable and for flour and vegetable milk manufacture. The bean meal is a valuable stock food and fertilizer and has a variety of industrial uses, and the soy bean oil is utilized extensively in many industries, especially the ply wood industry, which is an important one in Queensland. Although soy beans are of value as green manure, grazing, and hay crops they so far do not appear likely to displace cowpea for such purposes, because the latter yields heavily and consistently in most agricultural districts.

The soy bean is an annual, summer-growing plant, reaching a height of 2 to 5 feet. The branched, woody stems carry large leaves and bear the pods, which are from 1 to 2½ inches in length and contain 2 to 4 seeds. It is not so tolerant of acid soil conditions as are the cowpea and the velvet bean, but it is, nevertheless, capable of growing on fairly acid soils and on partly impoverished land. The soy bean will thrive on average quality soils but prefers the deep loams and red volcanic

soils which are favoured for maize. The plants withstand dry weather better than maize once they have become established, but they have not shown the drought resistance of cowpea.

Cultural Requirements.

Land required for soy bean production should receive the same cultural treatment as when being prepared for maize, and it is most essential that the seed be sown in a well-prepared seed-bed.

Sowing can be carried out at any time to suit local conditions after the danger of frost is over, care being taken to arrange sowing so that crops which are to be harvested three to five months later for grain will mature when fine weather might be expected. This is rather important because if the pods develop during prolonged wet periods they will be seriously affected by mould. As a general rule December and January can be regarded as suitable months for sowing. The crop is usually sown in rows 3 feet to 3 feet 6 inches apart according to the variety and the purpose for which the crop is grown. The seed should not be sown too deeply, a depth of $1\frac{1}{2}$ inches to 2 inches being ample. An ordinary maize drill is ideal for sowing. The seed varies greatly in size and consequently the amount of seed required per acre will vary, but for average-sized seed, sown in drills 3 feet 6 inches apart with approximately 6 to 8 inches between the plants, 15 to 16 lb. per acre will be ample. When sown broadcast, at least double that amount will be necessary.

So far it has been the practice in Queensland to sow the crop in drills as just described, but it may be found that a closer spacing between the rows will be necessary if large scale production is warranted; in such an event machine harvesting will be essential to permit of the crop being produced economically.

Varieties Under Test.

The chief named forage-type varieties under test in Queensland are A.K., Black Eyebrow, Ebony, Virginia, Wilson (early-maturing); Laredo, Mammoth Brown, Tarheel Black (medium-late); Biloxi and Ootootan (late-maturing); the most promising and also the most consistent variety so far, being Ootootan. Grain types include A.K., Dunfield, Illini, Ito San, Kingwa, Manchu, Mandell, Tokyo (early-maturing); Easycook, Haberlandt, Herman, Mammoth Brown and Mammoth Yellow (medium- to late-maturing). Of the grain varieties, A.K., Tokyo, and Easycook have given good yields. Mammoth Brown, Biloxi, and Mammoth Yellow varieties have seeds three or four times as large as those of Laredo, Ootootan, and Ebony. The seeds of the remaining varieties are intermediate in size, but all are much smaller than those of Mammoth Brown, Mammoth Yellow, and Biloxi.

The soy bean is a suitable crop for grazing by both cattle and sheep, a late-maturing forage variety, such as Ootootan or Biloxi, being chosen. Grazing may be commenced when the soy bean plants are 12 to 18 inches high and before flowering has started. Stock should be put on to a small section of the crop for only a few hours a day over a short period, and the section should then be spelled to allow the soy bean to recover.

Soy bean hay is a highly nutritious fodder and for haymaking purposes a leafy, late-maturing variety, either Ootootan or Biloxi, should be used and sown early, in rows spaced about 3 feet 6 inches apart.

The crop should be cut for hay when the pods are formed and the beans half developed. A mower or a reaper may be used to cut the crop which should be built into cocks shortly after cutting in order to prevent excessive drying. If the crop is cut with a reaper and binder the greatest care is necessary to see that the sheaves are not tied too tightly, otherwise moulds are sure to develop. Even when loosely tied it is advisable to examine the sheaves periodically during curing. Like cowpea, the crop requires very careful handling while curing to prevent loss of leaf, and the same treatment as is recommended for cowpea should be carried out in the case of soy bean.

When planted for green-manuring purposes, soy beans should be sown broadcast or in close drills, a late-maturing forage type being selected. The crop should be ploughed under before the pods begin to form.

If grown for grain purposes, the crop should be harvested just before the first pods commence to shatter. At this stage many varieties will have shed most of their leaves. Some varieties shatter very readily and care must be taken to harvest the crop immediately it is ready; otherwise a heavy loss of grain may occur.

So far, in this State, the crop has not been grown on a scale sufficiently extensive to warrant machine harvesting, but trials are under way to determine the practicability of doing so with a header. The methods at present in use are to cut the plants with a mower and cure them in stooks until they are ready to be put through a thresher, or to adopt the method in vogue for harvesting peanuts.

Insect pests and fungous diseases of soy bean pods have been common in experimental plantings in Queensland, and it is probable that commercial crops of beans would suffer similarly to some extent.

Soy bean may be used with either maize or sorghum for silage making, and generally a silage of good quality can be obtained from such a mixture.

Seed Not Yet Available.

It should be distinctly understood that no seed stocks are at present available for distribution to farmers by the Department of Agriculture and Stock, and that the small quantities of several varieties now held are required exclusively for trial purposes. In the event of seed supplies becoming available from abroad farmers will be duly informed through the Press.

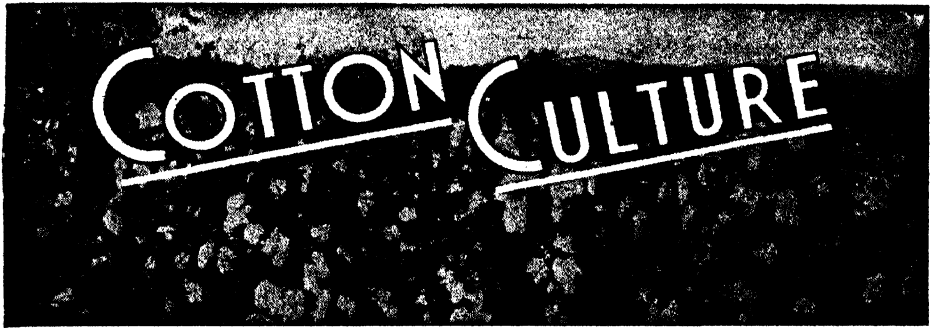
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A Review of the 1943-44 Cotton Growing Season.

W. G. WELLS.

Climatic Conditions.

CLIMATIC conditions for the 1943-44 season's cotton crop were reasonably favourable, although better rainfall at mid-January would have substantially improved yields in all districts. Excessive rainfall during December in the South Burnett, Moreton, Darling Downs and Maranoa districts—in which approximately 20 per cent. of the acreage was sown—promoted such growth of weeds and grass that with the prevailing labour shortage a considerable acreage of cotton had to be abandoned. In addition, the resultant deeply saturated heavier soils set so hard during the long dry period in January and February that plant growth was affected and much loss of the middle and top crops occurred.

In the remaining districts, weather conditions were, in general, favourable for early planting and thus ensured satisfactory growth of the resultant seedlings. By the end of December most fields were carrying such good crops, that substantial rainfall during January and February was required to mature them. Unfortunately, prolonged hot, dry conditions during January in some of the largest cotton growing districts, particularly in the Callide Valley, reduced yields appreciably, but the average ultimate returns where proper cultural practices had been followed were fairly satisfactory. Where sufficient rainfall occurred in January to promote steady growth until the February rains, very good yields were produced in the well cultivated crops.

District Irrigation Investigations.

The results obtained from the testing of the merits of growing cotton with supplementary irrigation supplied from individually owned plants were not, as a whole, in keeping with the possibilities of growing cotton with such assistance. Generally, co-operators either did not plant because of labour shortage or, for the same reason, were unable to maintain clean cultivation on the fertile alluvial soils under the wet spring and early summer conditions. In some instances where the crops got off to a good start, labour shortage also prevented an irrigation application at mid-season, when it was urgently required to obtain a good yield.

Biloela Research Station Investigations.

The results obtained in a comprehensive programme of experiments conducted at the Biloela Research Station indicated once again the advantages to be gained through planting cotton in the first three seasons following Rhodes grass. Confirmation also was obtained of previous findings of the value, to the following cotton crops, of the subsoil moisture conserved by March ploughing of Rhodes grass. Mid-September plantings on March ploughed grassland yielded 1,131 lb. seed cotton to the acre—a very satisfactory yield considering the period of five weeks of hot dry weather in January and February. Old cultivations once more failed to produce much in excess of 500 lb. seed cotton to the acre. Undoubtedly by ploughing their grassland in the late summer before the grasses have utilised the moisture from the summer rains, farmers can usually conserve a good supply of subsoil moisture which will materially improve the yield of the following cotton crop, particularly in early plantings.

The results of investigations into the merits of supplementary irrigation and the correct application of water, once again indicated that farmers should use this method of growing cotton where irrigation can be applied economically on soil suitable for that crop. On a fertile cultivation in the fourth year after native grassland, cotton planted in the third week of October following a 3-acre-inch spray irrigation, and given two similar applications at mid-season, yielded 1,741 lb. seed cotton to the acre, compared with 653 lb. in rain-grown cotton. In a five variety trial to ascertain the best cotton to grow under irrigation, the lowest yield was 1,822 lb. seed cotton to the acre, and the highest 1,927 lb. Altogether, 8 acres of irrigated cotton covering times of planting and watering, produced an average yield of 1,608 lb. seed cotton per acre.

Cotton Breeding.

The work of developing improved strains of the main commercial cottons was done under seasonal conditions which were conducive to testing the merits of the more advanced strains, and very promising results were obtained in some varieties.

A comprehensive programme of work at centres in the Moreton district and in the Central and Upper Burnett districts was carried out in the Triumph variety, as this appears to be one of the most promising cottons for very fertile soils of the lower slopes and the alluvial flats in these areas. The objectives of this work are to improve the strength and length of the fibres, as well as to increase size of boll without losing the earliness of fruiting and the yielding ability of the variety. Several of the newer evolved strains showed sufficient superiority to the parent stock in these respects to warrant their multiplication for eventually replacing it.

Satisfactory progress also was achieved in improving the Lone Star variety. This is a big boll type which has for years given the best results on the harder, less forcing soils in the drier cotton growing districts of the State. A good multiplication was obtained of the seed stocks of the most advanced strain of this variety, which produces more uniform fibre, has a slightly higher lint percentage and yields as well as the commercial stocks of the variety. The seed obtained will be further multiplied during the coming season to replace eventually the

older strains of Lone Star. In the breeding centre at Mundubbera, in the Central Burnett, several of the more advanced, newly evolved strains of this variety produced very satisfactory crops of large, well-opened bolls containing cotton of very good quality. In addition, these newer strains have substantially higher lint percentages than the commercial stocks of this variety. Providing further satisfactory results are obtained in subsequent trials of these newer strains, it would appear that the standard of performance achieved in them will place the Lone Star variety in a very satisfactory position.

The work of improving Miller, the most extensively grown variety in this State, was concentrated in the Callide Valley, where the most crops of this variety are planted. Sufficient seed was produced of the two more advanced improved strains to ensure of the complete replacement of the commercial stock of this variety, which has been grown for some years. Tests of progenies and multiplication stocks evolved out of these strains indicated that, in turn, superior strains will be available to replace them, not only because of greater uniformity of fibre, but also because of higher lint percentages.

The work of developing jassid-resistant types through either selection of superior jassid-resistant plants out of commercial stocks of Miller, or by hybridizing jassid-resistant varieties with otherwise superior Miller strains, progressed very satisfactorily at the Biloela Research Station and with grower co-operators in the adjoining districts. Tests of the Miller selection, III-26-0, indicated once more its very high degree of resistance to jassid attacks. Accordingly, the seed stocks of this strain will be multiplied sufficiently to supply the areas where a jassid-resistant Miller cotton is required. Several newer selected Miller strains with larger bolls and longer fibre than III-26-0 also gave evidence of high jassid resistance and will be further tested for their suitability to replace III-26-0. Very promising results also were obtained in both the multiplication plots of several of the most advanced hybrids evolved for jassid resistance, and in the breeding block of the newer hybrids.

Breeding operations in the New Mexico Acala variety consisted of a continuation of the work of developing a superior long staple strain for growing with supplementary irrigation in the Central district, and in the drier sections of the Upper Burnett, where this variety appears to be suitable for this method of growing cotton. In addition, in the South Burnett district, where this variety yields heavily under rain-grown conditions on the less fertile forest slopes, work was continued in the evolving of a strain producing stronger cotton than the present commercial stock. A mass-selected stock obtained in the previous season at the Callide Valley centre, showed superiority over the parent, and will, therefore, be further multiplied and reselected for eventual distribution to irrigationists requiring this variety. Several promising progenies were retained at the other centres for further testing. A large number of new selections also was obtained for examination in the progeny blocks of the coming season.

The ability of the Qualla variety to withstand very dry conditions when grown on infertile soil was again amply demonstrated this season, in the breeding plots of this variety in the Moreton district. Very satisfactory yields of good quality one-inch cotton were obtained in several progeny increases and new progenies which also retained the attractive size of boll of this variety. Sufficient multiplication of seed

of the most advanced progeny increase was obtained to allow of district trials being carried out in the coming season to ascertain the probable scope of usefulness of Qualla on the less fertile soils of the Moreton, Darling Downs and Maranoa districts, where a variety highly resistant to stress conditions is required. A large number of very promising new selections and twelve progeny increases were retained for further testing.

Harvesting.

Because of the increased demand for the Women's Land Army to harvest vegetable and fruit crops, approximately only 200 members could be made available for the cotton harvest. They were housed mostly in camps centrally located in areas in which there were sufficient acreages of cotton to provide full employment until the end of July, when the Army was required in other agricultural industries. A general scarcity of labour prevailed in all districts, and this shortage resulted in such a slow picking of the crop that a considerable proportion of it was harvested by snapping.

Grades.

The slow harvesting of the crop resulted in a lowering of grades of much of the cotton through long exposure to the weather. Moreover, the snapping of much good sound cotton lowered the grades of such cotton, as compared with those that would have been obtained by hand picking. The grades of the snapped cotton were better than usual, however, through the inclusion of so much well matured cotton that normally would have been hand-picked had ample labour been available.

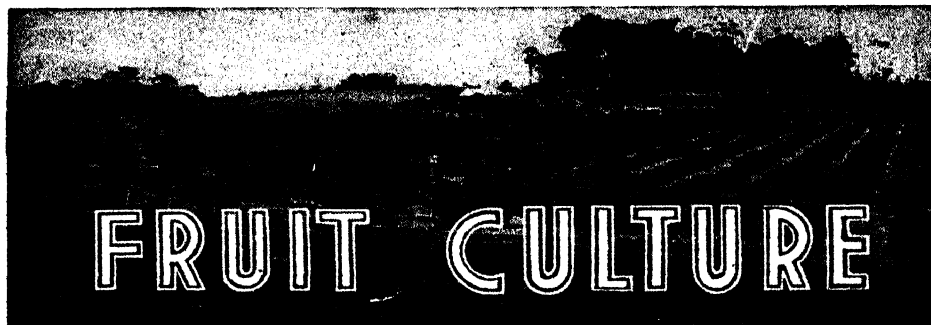
Acreage and Yields.

The season's results, as a whole, confirm the findings of previous years that early planting on well prepared seed beds containing a good reserve of subsoil moisture in cultivations in the first three seasons after grassland, undoubtedly improves the prospects of obtaining highly satisfactory yields of rain-grown cotton. Many farmers averaged yields of 700 lb. seed cotton to the acre or better, and, in some instances, 1,200 to 1,500 lb. to the acre on sizeable areas. The total yield from the 16,000 acres reported as producing cotton will approximate 6,000 bales of raw cotton, which will be the highest average return obtained for 24 years.

CHANGE OF ADDRESS.

Changes of address should be notified at least fourteen days before the date of issue with which the change is to take effect. The former address should be given as well as the full Christian names and surname of the subscriber.

Address all communications to the Under Secretary,
Department of Agriculture and Stock, Brisbane.



Some Tropical Fruits and Strawberries— Harvesting, Packing, and Marketing.

GENERAL HARVESTING CONDITIONS.

AS in the case of other fruits, care is essential for the successful handling of tropical fruit. Climate and temperature when harvesting is in progress are big factors in the successful carriage of tropical fruits to local and distant markets. These fruits are of such a delicate nature that every care must be taken to avoid carelessness and rough handling. Care should be taken by growers to see that fruit after harvesting is allowed to cool before being packed. Close attention to this point is necessary if fruit is to be carried over long distances and is expected to be in a satisfactory condition when it arrives on the market. Fruit packed while in a heated condition holds the heat for a long period during transit, thus causing premature ripening or sweating, with the certainty of the consignment opening up in an over-ripe or wet and musty state, which is just the condition suitable for the development of moulds and transit rots. Fruit in this plight has only a short commercial life, and has to be sacrificed by the agent to distributing retailers for rapid disposal, usually necessitating a substantial reduction in price to ensure a quick sale. Such sales often have a detrimental effect on the price or the demand for sound consignments. By taking advantage of the time of the day, and picking the fruit while its condition is unheated, pre-cooling is made considerably easier. If necessary, after picking, spread the fruit out in a cool place to reduce its temperature before packing. A flat-topped table with the surface covered with bags or other soft material is just the thing required for cooling, and is also a good sizing and packing bench.

PACKING THE PRODUCT.

Care in Making Cases.

Growers, after taking every care in handling their fruit while harvesting and packing, often, through carelessness in making and nailing down cases, offset an advantage already gained by careful handling. Careless nail-driving, causing nails to protrude inside the box from the timber of the case, often results in damaged fruit with consequent waste. Nail-marked fruit decays, breaks down, and affects adversely the sound fruit in the box. Nails protruding through the outside of a case are a danger to all handling it in transit, often causing bad cuts or loss of temper, and rough handling in consequence. Extra care in such matters is well worth while, and saves trouble.

The "Get Up" of the Package.

Attractiveness is the main feature to be studied, anything added or done to make the product worth more to the buyer being a big factor in quick sales and higher prices. The following points are well worthy of consideration:—

Use only clean, well-made cases. Second-hand cases should be thoroughly cleansed before using again.

Plain white or coloured paper is much more attractive and cleaner than newsprint, while the extra cost is only a fraction of a penny.

Where it is necessary to use packing, clean woodwool is preferable to most types of grass and other packing.

Fancy labels are an improvement, but if using stencils or rubber-stamps care should be taken to apply them neatly and so avoid smudging and spoiling the appearance of the finished package. The packer's full name and address, with variety and contents of the case, as required by the Fruit and Vegetables Acts, should be embodied in labels or stencils.

Wiring the case is an improvement. Often the wiring together of two small cases to make one package is an economy and an insurance against the rough handling of smaller packages. Wiring is also an attraction to the buyer who desires to despatch fruit to distant places.

CUSTARD APPLES.

Harvesting.

Picking custard apples at the right time is also essential in keeping buyers and consumers satisfied, besides helping in keeping up the demand. Custard apples picked too soon inevitably go black and become unsaleable and unattractive. The fruit should be picked when it is in a firm mature condition to ensure good carrying and ripening qualities. A good indication of the correct time to harvest custard apples is when the interstices between the corrugations of the fruit have turned to a rich creamy colour. Fruit picked at this stage, if firm, will carry well and ripen excellently. Packing will present no difficulties if the operation of sizing and that of packing are carried out separately.

Sizing.

To obtain the best results when marketing custard apples, care should be taken to pack the fruit in the best possible manner for marketing. Clean cases, nicely stencilled with the packer's name and address and the number of fruit in the case, add to the market value of the product. Most custard apple growers consider it unnecessary to size and pack their fruit. Like all other fruits, when this is done the value is considerably raised, both from the seller's and buyer's point of view. Buyers do not like to purchase fruit of mixed sizes, as they have no means of arriving at what a case containing varying sizes is going to realise when sold at so much per individual fruit at prices varying according to the size. When a case is sized this return can easily be calculated, and a price paid accordingly. When a buyer cannot calculate the actual return he is likely to receive for a case of fruit, it is only to be expected that he will be careful to safeguard himself and pay a lower price than the fruit is actually worth.

Sizing is an operation that should be carried out in the shed before packing. An excellent sizing table is one with a flat top, covered with clean sacks, with a 3-inch high beading around the edge to stop the fruit from rolling off. For best results the operator should size by hand into at least four different heaps of fruit of approximately even dimensions. It is also advisable to clean the fruit by carefully brushing if its appearance is affected by Mealy Bug or other pests.

Packing.

By packing two different counts from each heap packers will size the fruit automatically into six or seven sizes. The best container is the dump half-bushel case, 18 inches by $7\frac{1}{2}$ inches by $8\frac{3}{4}$ inches. For the larger sized fruit, with the counts 8, 10, 12, and 14, the case is best made up in the narrow way—viz., 18 inches long by $7\frac{1}{2}$ inches wide by $8\frac{3}{4}$ inches deep (see Plate 80); but for the smaller sized fruit, with the counts 15, 18, and 21, the wide way, 18 inches long by $8\frac{3}{4}$ inches wide by $7\frac{1}{2}$ inches deep, will be found most satisfactory. (See Plate 81.)

Following are the packs and counts:—

NARROW CASE PACKS.

18 inches long by $7\frac{1}{2}$ inches wide by $8\frac{3}{4}$ inches deep.

Pack.	No. in First Layer.	No. of Layers.	Total.
1 x 1	4	2	8
1 x 1	5	2	10
1 x 1	6	2	12
1 x 1	7	2	14

WIDE CASE PACKS.

18 inches long by $8\frac{3}{4}$ inches wide by $7\frac{1}{2}$ inches deep.

Pack.	No. in First Layer.	No. of Layers.	Total.
2 x 1	8	2	15
2 x 1	9	2	18
2 x 1	11	2	21

These packs and counts should pack any average sized line of custards, but growers with only a small quantity would possibly not need to do all of these counts.

With very large fruit it is better to adopt a single layer tray of a suitable depth. For distant markets the single layer tray is the best container. Owing to the irregular shape of the fruit commonsense has to be used in getting the fruit to fit in snugly, careful selection of irregular-shaped fruit to match each other being a great help in obtaining a good pack. Force should not be used under any circumstances. A bigger latitude in sizing is necessary in handling custard apples than in handling fruit such as citrus or tomatoes. Only a quarter of an inch variation is allowed in citrus and kindred fruits, but the variation in the sizes of custard apples will greatly exceed this according to the shape of the fruit. One of the main objects of packing is the protection that it gives the fruit, and growers when packing want to keep this

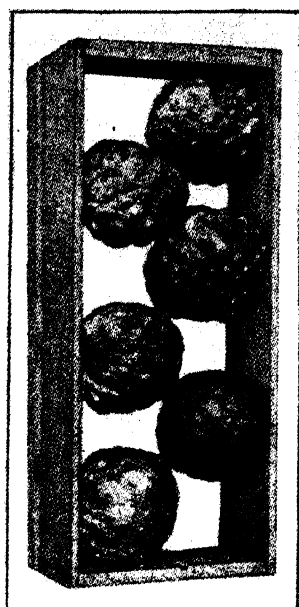
First Layer 1 x 1 Custard Apple Packs.



8 Count—1st Layer.



10 Count—1st Layer.



12 Count—1st Layer.

Note the protection given to the soft points of the fruit.

Finished Cases.



8 Count—Finished Case.



10 Count—Finished Case.



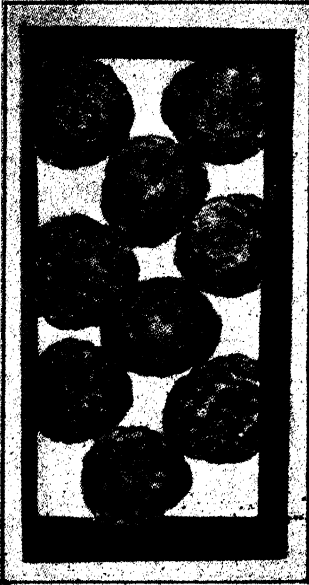
12 Count—Finished Case.

Plate 80.

CUSTARD APPLE PACKING FOR THE LOCAL MARKET.—Large sizes. Australian Half Dump Case. Case made on narrow system 18" long x 7½" wide x 8⅓" deep.

object in view. As custard apples soften first at the point or opposite end to the stalk, the packer wants to keep foremost in his mind the placing of fruit to the best advantage to protect the parts which might soften first while in transit. By keeping the point of the fruit turned

2 x 1 Custard Apple Packs.



18 Count—1st Layer.

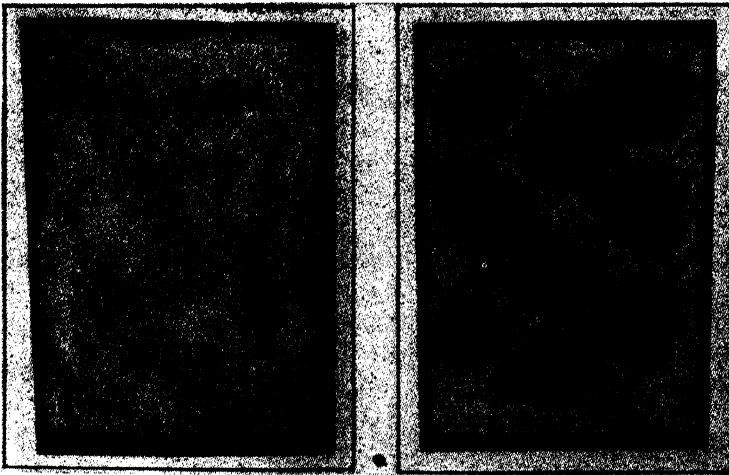


18 Count—Finished Case.

Note the protection given to the soft points of the fruit.

• Plate 81.

CUSTARD APPLE PACKING FOR THE LOCAL MARKET.—Small sized fruit. Case made on the wide system 18" long x $8\frac{1}{2}$ " wide x $7\frac{1}{2}$ " deep.



Case prepared with woodwool for placing the Custard Apples on.

Finished Case with the top layer of woodwool removed. Note the padding between each fruit.

Plate 82.

CUSTARD APPLE PACKING FOR EXPORT.

inwards from the wood of the box the maximum amount of protection is obtained from bumps and vibration during handling and in transit. A study of the illustrations will help to explain this.

If a packer happens to use other counts and packs than those given here, close attention to the protection of the fruit will be of assistance in good transit and satisfactory condition on arrival at the markets. Cases should be packed high enough above the top of the box to allow a slight pressure to be placed upon the fruit by the lid when nailed down. Care should be taken that there is no loose fruit in the case as the constant rattling and vibration in transit will soon render the fruit unfit for sale. It is well to remember that one broken custard apple will often make a mess of the whole consignment.

Packing for Export.

For long distance transport the best container is the single layer—half-bushel standard, 18 inches long by 11½ inches wide, by 5¼ inches deep—tray with the fruit nested or padded in woodwool. (See Plate 82.) The tray is first prepared by placing a layer of woodwool on the bottom and around the ends and sides. The fruit is then placed in position in a single layer with a small space between each fruit. It is advisable not to wrap custards when sending long distances, as it hastens the process or ripening. Woodwool is then placed in the spaces between the fruit to form a small pad for each fruit, and a layer is spread on the top of the pack and the case nailed down. The whole case should be packed so that it will not rattle when shaken gently. Fruit packed in this manner carried to Tasmania for show purposes, and although soft on arrival was exhibited for three days, and was then in still good eating condition. Fruit packed without woodwool in the same type of container was unfit for consumption on arrival at the show. Care should be taken that no fruit projects above the top of the tray before nailing down. Two trays wired together make a handy package for transport over long distances. No difficulties in marketing should be experienced by growers if judgment and commonsense are used in handling these fruits.

PAPAW PACKING FOR DISTANT MARKETS.

Sizing.

In packing papaws the foremost idea in the mind should be the best method of giving the maximum protection to the fruit in transit, and the packing of the fruit so that it will display to the best advantage when exposed for sale. Before being packed the fruit should be cooled and sized. To assist in making the operation of packing easier, it is a great help to endeavour to match the various-shaped papaws whilst sizing them into heaps. Four sizes should be sufficient to cover the packing of papaws for export. As with custard apples, sizing is easily done on a flat-topped table covered with soft bags or other suitable material. Many growers do not think it necessary to go to this trouble, failing to appreciate that the skin of the papaw is exceptionally tender, and that the slightest scratch will cause the fruit to bleed, thus damaging the appearance of the fruit.

Packing.

The best container for long-distance carriage of papaws is the tropical fruit case, 24½ inches long by 12 inches wide by 12 inches deep. (See Plate 83.) Woodwool is the most satisfactory packing. The box is prepared by placing a layer of woodwool on the bottom of the case and around the ends and the sides. Each papaw is then wrapped in soft paper and placed in a single layer in the prepared box, using small pads

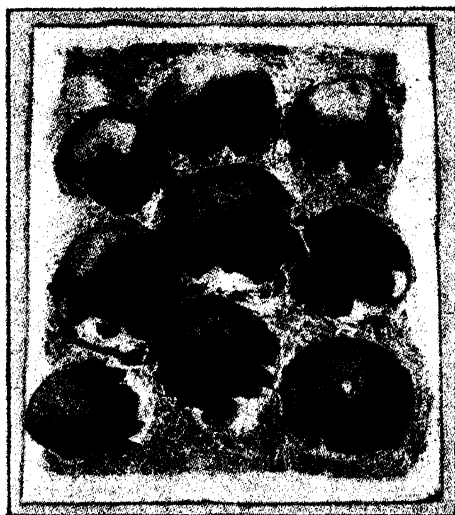
of woodwool to make individual fruit firm and snug. A thin layer of woodwool is then placed over the top of the fruit, and the process is repeated until the case is full, finishing off with a layer of woodwool packing on the top. It is unwise to have the fruit projecting too far above the top of the box, but the lid of the case should press just firmly enough to keep the fruit snug and firm. Packers should avoid placing too much padding in the case. Care in matching the various-shaped fruit will greatly assist in this. By using a coloured wrapper in conjunction with the woodwool a very attractive package can be placed on the market. Care in eliminating all green, over-ripe, or diseased fruit when packing is absolutely necessary to ensure safe transit and satisfaction to buyers.



Packed in Tropical Fruit Case 24½" x 12" x 12". Fruit wrapped in soft paper and nested in woodwool.

Plate 83.

PAPAWS PACKED FOR EXPORT.



Packed in the Dump Case used as a tray by removing the side; 18" long x 14½" wide x 8½" deep. Note the woodwool padding between the fruit.

Plate 84.

PAPAWS PACKED FOR LOCAL MARKET.

Packing for Local Markets.

Growers who are near enough to their markets to be able to use motor transport have a decided advantage over those who have to send over long distances. The fruit can be left on the tree to become almost fully ripe before sending to market, and it is not necessary to pack in the same manner as when sending farther afield. Close attention should be paid to the elimination of all disease-infected or marked fruit, and sizing should also be rigidly adhered to. The Australian dump case, made in the form of a tray 18 inches long by 14½ inches wide by 8½ inches deep, is a good container for the local market (Plate 84). The fruit is packed on end in a single layer resting on a layer of woodwool or similar packing. As a protection against rubbing the bottom end of each fruit, it should be wrapped for about two-thirds of the way up in clean white

or coloured paper, while each fruit is made snug and tight by pushing pads of woodwool in between each fruit. Papaws packed in this way have a very attractive display value, and sell much more readily than those carelessly placed in cases without packing, the buyer being able to appreciate the quantity and quality at a glance.

MONSTERA DELICIOSA.

Packing for Distant Markets.

This is a fruit that is not well known out of Queensland. Many people tasting the monstera for the first time are favourably impressed, and are keen to know where supplies can be secured. Many specimens of this fruit bought by people, however, do not come up to expectations because growers are afraid to allow the fruit to stay long enough on the plant on account of its tendency to fall to pieces when ripening. The latter tendency can be overcome by winding a strip of paper around the fruit when packing, to prevent the outside shell from falling as the fruit ripens. Fruit packed like this will ripen over its entire length, and still retain its full flavour when consumed three weeks after being harvested. The standard half-bushel case, 18 inches long by 11½ inches wide by 5¼ inches deep, is an ideal case for the monstera. The fruit is packed in layers and made snug by placing a thin layer of woodwool on the top and bottom and between the layers. Lining the case with clean white or coloured paper is an added improvement to the appearance of the case.

PACKING STRAWBERRIES.

Containers.

Many containers are used for marketing strawberries. In some of the Southern States a punnet is in general use, but as this container has the disadvantage of containing more than one layer of berries with each layer resting upon the other, it is not as good a container as the single layer packed boxes in general use in Queensland. There are two types of boxes in use—one which measures 8 inches long by 4 inches wide by 1½ inch deep, and the other 24 inches long by 8 inches wide by 1½ inch deep, measured clear of a central partition which it has. The smaller of the two containers is preferable, because it gives less latitude for mistakes and spoiling the appearance and alignment of the fruit when packing. Being smaller, it will not give the fruit as much play to become loose in the box through careless handling, so causing damage through rubbing and otherwise. It is also a better container for retailing, the larger box or tray, which contains the equivalent of six smaller boxes, holding too much fruit for the average buyer, necessitating repacking into smaller boxes. As the strawberry is such a soft fruit, it is necessary to handle it as little as possible. The smaller container also has the advantage of allowing better sizing and packing when the supply of fruit on the farm is short for marketing. Twenty of the boxes 8 inches by 4 inches by 1½ inch will just fit comfortably into a half-dump case.

Handling.

Unlike other fruits, the strawberry does not necessitate a large, complicated, costly equipment in the packing-house to size and grade. This is done by hand, and much labour can be saved by grading while picking. Sizing is best done in the packing-house.

A good picking container is a tray with a handle. (See Plate 85.) When picking, the first-class berries fit for marketing can be placed at

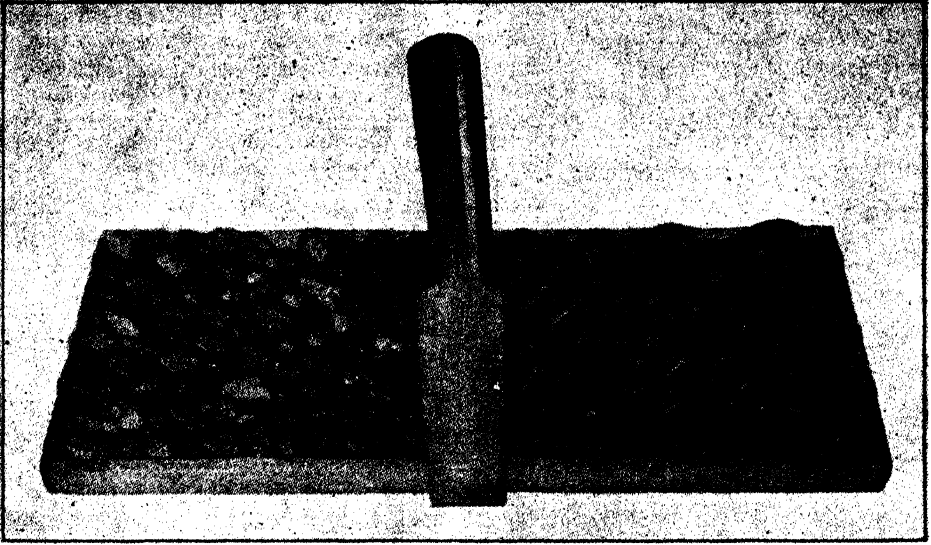


Plate 85.

PICKING TRAY FILLED WITH FRUIT.—Note the different grades and colour of fruit that are placed at either end of the tray when picking.

one end of the tray, and second-class or factory berries placed at the other. By doing this the berries are automatically graded. Berries are packed for market in three sizes—threes, fours, and fives. Sizing is done while packing, the packer having a box for each size. Women and girls usually make the best berry packers, having as a general rule a lightness of touch which is often lacking in the case of men operatives. Berries with grains of earth adhering to them, as is often the case after rain, should be gently brushed. This can be done by placing a soft lacquer brush as a fixture, standing upright in the bench, and by taking the berry by the stalk and gently running it through the bristles of the brush.

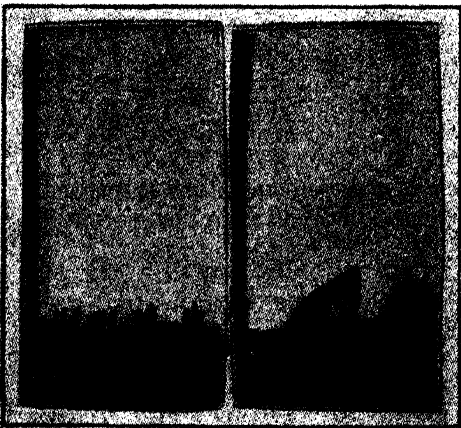


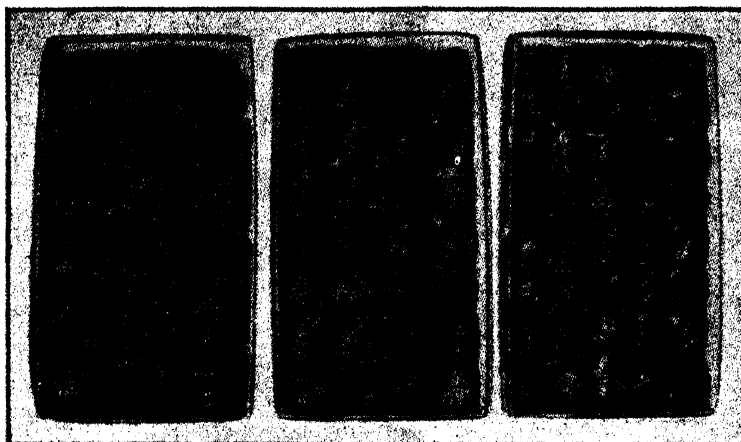
Plate 86.

METHOD OF STARTING TO PACK.—Note the placing of the leaves to separate the fruit.

Packing.

The method of packing is simple enough. The box is first prepared by placing a prepared leaf across the end of the box —passion fruit leaves are very suitable, while fern leaves are sometimes used where passion fruit leaves are not available—with the leaf projecting high enough to reach to the top of the box, and at the same time being bent enough to place thereon the first line of berries—threes, fours, or fives, according to size. The berries should be placed on their stalk ends with the points up, allowing the point of the

fruit to reach to the level of the top of the box. (See Plate 86.) Another prepared leaf is then placed in the box, bent so as to rest on the bottom of the box to have the next line of berries placed thereon, while the remainder of the leaf rests against the first line of berries and acts as a separator of the lines of fruit. This process is repeated until the box is filled. (See Plate 87.) For travelling a layer of leaves placed on top of the finished pack is an assistance.



Threes.

Fours.

Fives.

Plate 87.

FINISHED BOXES.—Note the alignment of the fruit in each box. Also the placing of the leaves between each row of fruit.

Points to be watched are—

See that the fruit is placed so that it will come as near as possible to the top of the box, and it will then keep snug when the lid is placed in position.

Avoid packing too high.

Keep the alignment of the fruit straight both across the box and from one end to the other. (See illustrations of packed boxes).

Avoid placing too large pieces of packing leaves between the berries.

See that the berries do not rattle in the box after the lid is placed in position.

Keep all badly-coloured berries out of the box, as they spoil the commercial appearance of the package when displayed for sale.

On no account pack damaged berries, no matter how slight—they spoil the keeping qualities of the box. One bad berry soon makes a whole boxful practically unsaleable.

It is recommended that growers should stamp the pack of the fruit on the lid of each box, so that when being sold the seller can see at a glance whether they are threes, fours, or fives without having to remove the lids. This would be in addition to the name and address of packer required by law in letters $\frac{1}{8}$ inch at least in height to be stamped on the top of the lid and the end of the box. Use rubber stamps, as they are quick in application and make a finished job. When sending away packed in cases, see that stencilling is done neatly and free from edge of the stencil plate smudges.

APPLIED BOTANY

New Guinea Timbers.

C. T. WHITE.

The following notes on some of the trees of New Guinea were made by Mr. White, Government Botanist, in the course of a tour, under Army auspices, during July and August of this year through parts of the territory freed from Japanese invasion.

FOR the main part, New Guinea is covered with a dense, heavy rain forest or jungle, known in Queensland as scrub, and in New South Wales as brush. Along the south coast of the country, however, there is much open forest very similar to the forested grasslands of North Queensland and the Northern Territory. There is an undergrowth of grasses and herbs with a covering of Eucalypts, mainly of the bloodwood group. In the more swampy areas, different kinds of tea tree and swamp mahogany take the place of the Eucalypts. Extensive areas are also covered with large sac sac or sago swamps.

A feature which distinguishes New Guinea very sharply from Australia is the height of the mountains which reach their greatest altitudes in Dutch New Guinea with Mount Carstenz 16,400 feet, Mount Wilhelmina 15,416 feet, and Mount Juliana 14,760 feet. The interior of the whole country is extremely mountainous and the ranges running the length of the interior sharply cut off the Australian element in the flora from the northern side.

Although the Australian element in the southern half of the island is mainly developed in the open forests, it enters also into the rain forests in the form of Silky Oaks and Flindersias, the latter group including the North Queensland Maple, Silk Wood, Cairns Hickory, and other valuable Australian timber trees. In the northern half, the Australian element is almost entirely missing. A few of the trees are common to North Queensland and New Guinea, but most are confined, it is thought, to the latter country or are of Asiatic origin. In addition to the rain forests, there are some big areas of grassland with very few trees, but Eucalypts or gums are absent, their place being taken by a small leguminous tree, *Albizzia procera*, abundant in North Queensland especially from Townsville to Mackay, where it is commonly known as "acacia."

The commonest tree in the northern rain forests is probably Tauan (*Pometia pinnata*), being cut extensively for use at the present time. It is a large tree 100 feet or more high, with a good bole buttressed at

the base and with a heavy crown of foliage. It is a very good useful interior wood of a reddish colour. One advantage is that it bends well and C. E. Lane Poole, in his valuable report on the timbers of New Guinea, states that it has been used for boat planking with some success. Botanically, the Tauan is very closely related to the lee chee, the well known Chinese fruit often seen in the dried state in Australian shops, but much superior when fresh. As in the lee chee, a whitish, creamy, somewhat translucent pulp surrounds the seed, and this is a favourite delicacy with natives and whites alike.

New Guinea Walnut (*Dracontomelum mangiferum*) is commonly associated with Tauan. It is a large tree buttressed at the base with rather a light-brown scaly bark; the scales shed in patches, leaving a smooth trunk. The heartwood is hard and dark, with a walnut grain and is a very pleasing furniture wood. Botanically, it is more nearly allied to the Burdekin Plum than to the North Queensland Walnut. The Burdekin Plum (*Pleiogynium Solandri*) is also found in some parts, particularly in the south-east, and is cut to a limited extent. It is an excellent wood for turnery and makes up into handsome furniture.



Plate 88.

A LARGE ERIMA TOWERING ABOVE
THE RAIN-FOREST.



Plate 89.

BASE OF LARGE ERIMA SHOWN IN
PLATE 88.

New Guinea Rosewood (*Pterocarpus indicus*), an excellent cabinet timber of a deep reddish colour, is one of the most beautiful of New Guinea woods. Unfortunately, the trees are mostly of somewhat irregular growth and have a habit of sending out branches from the side of the trunk. The tree can be easily identified in the field by the red blood-like sap which runs freely from it when cut.

New Guinea Teak (*Vitex cofassus*) is another beautiful timber, but like Rosewood the trees are often gnarled and have many side branches. It is closely allied and similar in appearance to the Lignum Vitae of Eastern Australia (*Vitex lignum-vitae*). The dark heartwood is a good general purpose timber. It is much favoured by the natives for making canoe paddles.

Busu Plum (*Parinarium corymbosum*) is a wood which was determined specifically on a recent visit to New Guinea. It is a rather dark, handsome timber which should be suitable for high-grade cabinet work.

Pacific Maple is a general name for several timbers of a pale reddish colour which I have been unable to determine specifically. They are cabinet woods of a similar type to Queensland Red Bean or Miva Cedar.

Erima (*Octomeles sumatrana*) is worthy of mention as being one of the largest of New Guinea trees. Good specimens are nearly 200 feet high, heavily buttressed to a height of 12-15 feet or more, and with a girth of 15 feet above the buttresses. They provide a clear bole of approximately 100 feet. It is a very light timber, but is suitable for all classes of indoor work. On the Papuan side it is mostly known as Ilimo, but the New Guinea name Erima has been adopted for it by the trade.

Trees also worthy of mention are the Dipterocarps, a group not found in Australia, although furnishing the main building timbers of Malaya and the Netherlands East Indies. They are found in patches in New Guinea, attaining their greatest development in the north-west portion and around Milne Bay. Some of them yield valuable resin (Malay dammar). The resin of at least one of them in New Guinea (*Vatica papuana*) has been collected at Sudest and exported to Sydney where it has been used in the manufacture of varnishes. It is a beautiful clear gum somewhat resembling in outward appearance the Kauri Gum of New Zealand.



Plate 90.

A FINE CALOPHYLLUM TREE ON THE SEA-BEACH.



Plate 91.

SILK-COTTON TREE (*Bombax*).—A large soft-wooded tree with red flowers.

Coniferous trees are well developed in the mountains, and there are some excellent stands of Hoop Pine (*Araucaria Cunninghamii*) and Klinki Pine (*Araucaria Klinkii*). The latter more resembles in growth the Bunya Pine of Queensland (*Araucaria Bidwillii*), but the cones, seeds, and seedlings are more those of the Hoop Pine. As in Australia, these *Araucaria* trees stand out on the skyline along the tops of the mountain ridges. The Chief Forester for the Territory of New Guinea, Major J. B. McAdam, has experimented with the propagation and growth of the Klinki Pine and has obtained some remarkable results. It is on the whole a bigger tree than the Hoop Pine, 150 feet being an average height and trees well over 200 feet have been found.

Kauri Pine (*Agathis loranthifolia*) so far as I know does not occur either in Papua or the Mandated Territory, being confined to the mountains of Netherlands New Guinea. The She Pines or Brown Pines (*Podocarpus*) are well represented and produce high-quality, sound, firm timbers. The Celery Top Pine (*Phyllocladus hypophyllus*), very similar to the Tasmanian Celery Top, is abundant at altitudes of 7,000-9,000 feet.

Associated with the Conifers are the true Oaks, genus *Quercus* in a broad sense, a group not found in Australia. The New Guinea Oaks are naturally more closely allied to those of the Himalayan region and mountains of south-east Asia than to those of the Northern Hemisphere, but all possess good, hard, durable timbers. It is strange they do not occur in Queensland as they are found on both sides of the main central divide of New Guinea and although essentially mountain trees, they descend to altitudes of 1,000 feet and odd trees have even been seen at 800 feet above sea level.

So far, with the exception of the Oaks, all timbers mentioned are of the softwood class which predominates in New Guinea. Of hardwoods one of the most important is the Kassi Kassi (*Xanthostemon* sp.) of the Milne Bay region. It is a timber closely allied to and of the same type as Queensland Penda.

Kwila (*Azelia bijuga*) is a tree about 80 feet high, with rather a sparse crown and thin light-brown bark. It is much sought after for posts and piles, being more durable in the ground than other New Guinea timbers. It is similar to West African Mahogany, but is rather too heavy for general cabinet work. On the Papuan side it is mostly known as Melila.

Kamarere (*Eucalyptus Naudiniana*) is a large tree over 200 feet high, which forms large stands in New Britain. It is a Eucalypt and the only one found on the northern side of the Territory of New Guinea. It is quite distinct in appearance from most Australian trees of that family. As a timber, it may probably be best compared with the Blue Gum of New South Wales or Flooded Gum of Queensland and more distantly with the Karri of Western Australia.

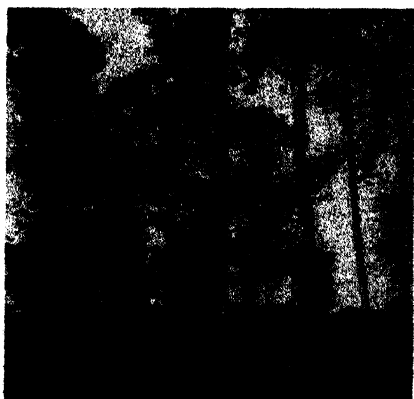


Plate 92.

NEW GUINEA CABBAGE (*Gnetum*).—The leaves of this tree are cooked as greens. It is characterised by scars around the trunk like those of a palm.

No account of the timber trees of New Guinea would be complete without some reference to the mangroves, large forests of which are found in all estuarian waters along the coast. They are being extensively used at the present time for wharf piles. Unfortunately, their life is limited because of the devastating attacks of marine borers. The most abundant is the Red Mangrove (*Rhizophora mucronata*) and it comprises the bulk of the piles cut. It is also common along the whole of the Queensland coast, but in New Guinea the trees are taller and of greater girth. By means of its prop roots it can extend further out into the water than the other mangroves.

Another fairly common species is the Black Mangrove (*Bruguiera Rheedii*). This has rather rough blackish bark, hence the local name. Its roots run along the surface of the mud and turn upwards here and there forming large knob-like processes, which act as breathing organs for the underground root system of the tree.

A common constituent of the mangrove forests is the Cannon Ball or Puzzle Nut Mangrove (*Xylocarpus granatum*), a tree with a very smooth mottled bark and hard wood. The fruits, about the size of an infant's head, are full of large, light corky triangular seeds. Mangroves are important trees in the East and the management of mangrove forests is recognised as one of the regular duties of foresters. It is possible they may yet become of importance in the forestry policy of New Guinea.

In this brief sketch, only the main trees and mostly those known to me personally are described. The forests of New Guinea are of a very diversified nature and the list of trees attaining a height of over 60 feet and stem diameter of a foot or more would run into several hundreds.

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

Shade Trees in the Southport District.

W.P. (Worongary)—

The most suitable trees for river flats and swampy areas around Southport are the Cotton Tree (*Hibiscus tiliaceus*) and the Cupania Tree (*Cupania amacardioides*), both native trees. The Cotton Tree is fairly conspicuous on the southern side of Burleigh Headland facing Tallebudgera Creek. It is a spreading tree with broad leaves and large yellow flowers. These trees also may be used for windbreaks, for which purpose they could be planted more closely together than when used for shade trees.

For a hedge plant, try the common *Duranta* (*Duranta Plumieri*). There is another shrub or small tree which could be used as a hedge. It is generally called *Vitex*; its botanical name is *Vitex trifolia*. There are many shrubs of this plant on the southern end of the Marine Parade at Coolangatta. It apparently has not been planted there, as it is commonly found in such seaside localities. There is no certainty as to how much flood water these two hedge plants will stand. If the trees and shrubs are not obtainable from nurserymen such as Mr. Chas. Petersen, Kuraby, and Mr. Thos. Perrott, of 38 Bowen Bridge road, Valley, Brisbane, you may be able to obtain them through the Town Clerk, Brisbane City Council.

Grass Specimens Named.

W.B.H. (Gympie)—

The grass specimens are as under—

1. Barbed Wire Grass (*Cymbopogon refractus*), a common grass of inferior natural pastures in Eastern Queensland. It has relatively little value as a fodder grass.
2. A species of *Digitaria*. All seed has fallen so that it is not possible to say precisely to which species it belongs. Most of the species, however, are fair fodder grasses.
3. Kangaroo Grass (*Themeda australis*), a common species of natural pastures, particularly on hillsides. It is a fair second-rate grass for grazing, but its carrying capacity is rather low for satisfactory dairying practice.

ANT PROTECTIO

Animal Pests of Field Crops.

J. HAROLD SMITH, Senior Research Officer.

SEVERAL small animal pests are well known in farming and grazing areas by the damage they cause to cultivated crops in the field and to orchard, ornamental, and shade trees. Both rodents and marsupials are implicated.

Of the several species of rats in Queensland, some tend to concentrate in towns and cities, others remain exclusively in the field, and a few are found both in the field and in adjacent farm buildings where grain and grain products are stored. In sugar-cane areas, field rats attract a great deal of attention because the injury to the growing crop is often followed by a certain amount of lodging which creates harvesting difficulties in some seasons. In fruit-growing areas, pine-apples are frequently attacked, large cavities being gnawed into the fruit before it is mature. When numerous, rats may feed on the bark of fruit, ornamental and shade trees, particularly in sub-coastal and inland areas. The injury is restricted to the lower part of the trunk, but if it is extensive, growth may be severely checked or the trees may even be killed outright. Quite apart from their importance as pests of growing plants and stored produce, rats are vectors of Weil's disease, an occupational trouble recorded in field workers among rat-infested crops.

Field mice are also pests of field crops though they are better known by the damage caused to stored grain in farm buildings and to cereal hay stacked on the farm. In field crops, they tend to be most troublesome during late winter and spring when the weather is dry and feed is relatively scarce in the paddocks. Carryover crops such as late maize and sweet potatoes, and spring planted crops, such as pumpkins and cucumbers, suffer to some extent almost every year. In the latter case one or more holes alongside the seed-hills indicate the burrowing activities of the pest as it seeks the seed. Discarded husks usually lie in and around the holes. If the failure of the first planting is due to mice, subsequent sowings usually suffer more severely than the first, possibly because the pest continues to exploit a food supply which it particularly likes. Mice nests, constructed from dead grass and similar debris, are sometimes a nuisance when surplus grass on permanent pastures is cut for hay for the nests foul the cutter bar of the mower and stop the machine. Troubles of this kind are less common in cereal, lucerne, or Rhodes grass hay crops which are normally cut some inches above ground level.

Rabbits are at present restricted to south western Queensland where they invade market gardens from adjacent infested grazing areas. Hares, on the other hand, occur in all parts of the State. Both of these rodents feed on the more succulent growth of the plant and attacks can therefore be expected in cultivated crops shortly after the seed

germinates. The damage is usually first noticed at the margin of the field and tends to be most severe in winter and early spring when natural feed is relatively scarce.

Bandicoots are frequently responsible for faulty strikes in maize paddocks on scrub farms. When they are active, innumerable holes will be found along the rows shortly after the crop is sown, and gaps in the seedling stand will be extensive. How far the pest is attracted to the planted area by the seed and how far by the white grubs which commonly occur in scrub soils is a moot point, but, directly or indirectly the bandicoot is the pest and must, consequently, be controlled. Wallabies are also troublesome on scrub farms, particularly when the property is surrounded by standing rainforest. They graze on any young crop to which they find access and sometimes cause a great deal of damage.

CONTROL MEASURES.

Control measures for these pests vary a great deal. Mechanical or chemical barriers may keep them at bay, but, if they live in the crop, poisoning is usually necessary. Nevertheless, all control measures must take into account such factors as the cunning of the rat, the curiosity of the mouse and the shyness of the wallaby, as well as the food preferences of the particular pest and its behaviour in cultivated crops. Considerable skill and experience are therefore required in applying them.

Nest Destruction.

Of the pests under consideration, only the rabbit has community nesting habits which permit centralised control measures. Rabbit burrows are conspicuous and it is sometimes feasible to eradicate all the inmates by fumigation. The most commonly used and most effective fumigant is calcium cyanide, a fine powder which releases the poisonous prussic acid gas on exposure to the air. The commercial form of calcium cyanide is sold as Cyanogas, the powdered form of which is blown into the burrow opening by means of a specially designed power duster. After applying the dust to the burrow system, the entrances are sealed off with soil in order to prevent the gas from escaping.

Mechanical and Chemical Barriers.

Hares and rabbits can often be excluded from vegetable and other valuable crops for a period of four or more weeks by erecting a repellent barrier around the area. Binder twine or fine rope soaked in a bath of creosote or hot tar will serve the purpose if it is tied to pegs and kept six inches above the ground. The pegs should be spaced about six yards apart and the impregnated string pulled tight and attached to each with a half hitch. The corner pegs may require bracing. The barrier must extend beyond the ends of the furrows in order to permit the free movement of implements at the ends of the rows, and a "gate" must be provided to allow the entrance to and exit of teams, &c., from the crop. The period during which such a barrier remains effective varies with both temperature and rainfall and is longer in dry districts than in wet. However, as the crop normally needs protection only during the young stages of growth, such a barrier can be very useful if it is properly erected as soon as the depredations of the pests are observed. More durable, though more expensive protection can of course be given to the crop by erecting a wire netting fence around the area. Such a fence must be pegged to the ground in order to prevent the pests from passing underneath it.

Pests such as rats, rabbits and hares which gnaw the trunks of trees near ground level can be kept away from the plants by galvanized

iron barriers. These barriers must be high enough to prevent the animal from jumping over them and they should lean outwards from the tree. While such barriers may be useful for the protection of a few trees, they are scarcely adapted for large scale control work in orchards or windbreaks during outbreaks of epidemic proportions. The position may then be eased by painting the lower parts of the trunks with a repellant wash containing sulphurized linseed oil. This wash is prepared by heating one gallon of linseed oil in a four gallon drum to a temperature of 470 degrees Fahrenheit when a blueish smoke is given off. The oil is then removed from the fire and 12 ounces of powdered sulphur are gradually stirred into it. The relatively large drum is needed to prevent spillage for foaming takes place when the sulphur is added to the hot oil. After the mixture has cooled, it is brushed onto the trunk of the tree from ground level to a height of two or three feet.

Poison Baits.

The protection of growing plants from animal pests by mechanical or chemical barriers is mainly a temporary expedient and has invariably to be followed by measures designed to reduce the pest population. Poison baits are largely used for this purpose. All baits contain a poison incorporated in a suitable carrier which the pests take readily. Strychnine is the most efficient of the several poisons used for these baits and some of the more commonly used formulae are:—

Coated Grain Bait.—1 oz. powdered strychnine alkaloid; 1 oz. baking soda; 1 teaspoonful saccharine; half a cupful starch; 10 to 25 quarts grain. The bait is suitable for rats, mice and bandicoots.

The first four ingredients are added to one quart of water and heated gently with constant stirring into a thin paste. This paste is then poured over the cereal which is repeatedly turned until every grain is effectively covered. The grain is then spread out in the sun to dry and later distributed in small heaps of a tablespoonful or thereabouts wherever the pest is active. The amount of grain used in the formula depends on the size of the pest; the smaller the animal, the greater the amount of grain. Rolled oats is a particularly good carrier for rat and mice baits but wheat or maize may also be used if they are more readily available. Maize is invariably used in bandicoot infested areas. Coated grain baits are particularly resistant to the weathering effects of rains.

Soaked Grain Bait.—1 oz. strychnine hydrochloride (or sulphate); 4 lb. brown sugar; 10 to 25 quarts grain. This bait is suitable for rats, mice and bandicoots.

The strychnine hydrochloride (or sulphate) and brown sugar are dissolved in half a gallon of boiling water which is then poured over the grain in a suitable vessel. The mixture is heated gently for a few minutes, dried and used immediately in the same way as the coated grain bait.

Dry Grain Bait.—1 oz. powdered strychnine alkaloid; 1 oz. baking soda; 10 to 25 quarts crushed grain. This bait is suitable for rats, mice and bandicoots.

The powdered strychnine and baking soda are first mixed thoroughly and then sifted over the grain as it is being stirred. Heaps of the treated grain are distributed wherever the pest has been feeding. The dry grain bait is not very resistant to weathering and should therefore only be used in fine weather or, alternatively, it should be protected from rain by a suitable cover.

Chaff Baits.—1 oz. strychnine hydrochloride (or sulphate); 20 to 30 lb. lucerne chaff. This bait is suitable for rabbits, hares, and wallabies.

The lucerne chaff is first moistened with water. Two gallons of water in which the prescribed amount of strychnine has been dissolved are then sprinkled over the chaff as it is being turned. As soon as it is prepared, handfuls of the poisoned chaff are distributed along the pads in the field.

Sweet Potato Bait.— $\frac{1}{8}$ oz. powdered strychnine alkaloid; $\frac{1}{8}$ oz. baking soda; 3 quarts sweet potato cubes. This bait is suitable for rats, mice, bandicoots and wallabies.

The sweet potatoes are cut into half inch cubes and when still moist, the mixture of strychnine and baking soda is sifted over the mass as it is being stirred. The treated cubes are distributed in small heaps wherever the pest is active.

The only other baits likely to be used on the farm for the control of animal pests contain phosphorus or thallous sulphate as the toxic ingredient. Yellow phosphorus, the form used in bait formulae, is highly inflammable, and is usually marketed in a paste along with other ingredients such as tallow, molasses and a ground cereal. These commercial pastes are generally mixed with pollard or spread over suitable carriers such as slices of bread before the baits are laid. The manufacturers' directions should be followed in detail. Thallous sulphate baits are marketed only in the fully prepared state for use against rats; the packages containing poisoned grain are distributed throughout the infested area.

The baits must be distributed in places where they can be easily found by the pest. In the case of rabbits, hares and wallabies, they can be laid at intervals along the pads leading into and through the field. With other pests, the baits are scattered through the feeding area in which damage has occurred. Normally, baiting should begin as soon as the damage threatens to become of economic importance.

All baits used for the control of animal pests are very poisonous. They must therefore be used carefully in order to minimize the danger to cattle, horses, sheep and poultry, which should be excluded from the baited area. The position of all baits should be marked with characteristic pegs so that they can be easily located and examined at regular intervals. Such examinations give valuable clues as to the feeding habits of the pest and often suggest modifications in the placing of the baits which will make the control measure more efficient. They also simplify the collection and destruction of the baits at the conclusion of the control work.

The grain carriers used in some rodent and marsupial baits are attractive to birds, and reasonable precautions should therefore be taken to prevent them from finding the baits. Normally birds take little interest in baiting operations if the baits are concealed in sections of tile drains or covered with V-shaped pieces of wood. The former are readily available and the latter can be easily made on the farm; either may be used when the pest implicated in the damage on the farm is a small rodent.

Finally, emphasis must be laid on the fact that strychnine and other poisons must be handled with care. All utensils used in the preparation and distribution of the baits must be thoroughly washed before they are set aside. Unused baits which deteriorate on storage should be destroyed along with any spent baits collected in the field. Baits which can be stored are best kept in sealed and prominently labelled tins.

Black Rot and Black Leg of Cabbage and Cauliflower.

F. W. BLACKFORD, Assistant Research Officer.

BLACK rot is the most frequently encountered disease of the cabbage and cauliflower in Queensland, this bacterial trouble being particularly severe in summer-grown crops of cabbages. Black leg is a fungous disease which is also sometimes present in both these vegetables and, because of the similarity of the control measures recommended for the two diseases, they can appropriately be discussed together.

The most characteristic symptom of black rot is the discolouration of the water-conducting vessels in the stem of an affected plant. These vessels become black in colour and appear as black pin points or—in advanced cases—as a black ring, if the stem is cut across (Plate 93); if it is split longitudinally they appear as black streaks. The bacteria* which cause this disease gain entrance to the water-conducting vessels through the leaves, where, at the point of infection, which is usually near the margin, patches of the leaf-blade dry out and turn brown and papery. Severely affected plants are somewhat stunted and, especially in wet weather, other organisms gain entrance to the heads and a foul-smelling, slimy rot ensues.

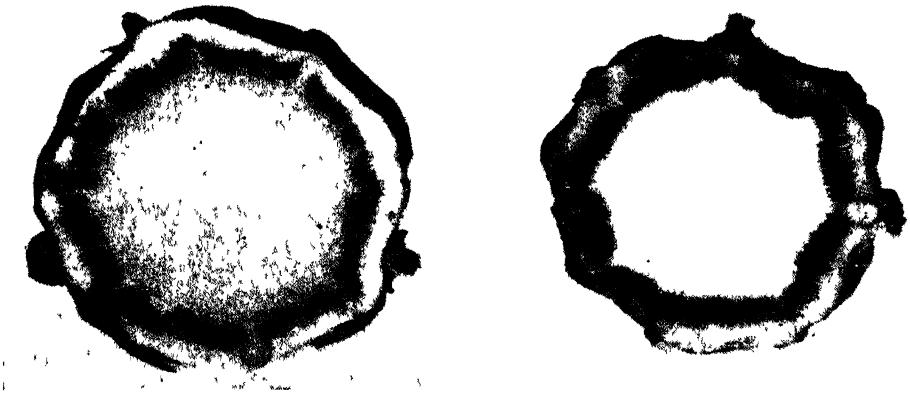


Plate 93.

BLACK ROT OF CABBAGE.—Cross section of the stems of a healthy plant (left) and a diseased plant (right) to show the blackened water-conducting vessels.

The organism which causes black rot may infect the seed both internally and externally and infection of the leaves may take place in the seed-bed by the splashing up of drops of water from the soil which has become contaminated from infected seed. Refuse from previous cabbage or cauliflower crops rotting in the soil may also harbour the parasite for twelve months or more.

The first symptom of black leg to be noticed by growers is generally the failure of certain individual plants to keep pace in growth with the rest of the crop. Close examination of such plants reveals the presence of a black, shrunken area on the stem at ground level. This lesion may extend sufficiently to girdle the stem in which case the plants die. An examination of the seed-bed from which such plants were taken

* *Pseudomonas campestris*.

frequently discloses the presence of the lesion on at least some seedlings and these may be stunted, yellow and occasionally wilted. If seedlings which are only slightly affected—and slight infection is easily overlooked—are planted out, the stems may become severely infected later and an uneven, unsatisfactory crop is the result. The disease affects the leaves and also the seed-heads, if the crop is allowed to seed, and produces brown, dead spots studded with black pin points, which are the spore-bearing bodies of the fungus* causing the disease. The individual spots on the leaves may be up to half an inch in diameter and on the seed-head the disease appears as elongated, shrunken areas on the stems and pods. The seed may be infected from these spots, the fungus even penetrating the outer seed-coat to lie dormant in the internal tissues until the seed is sown. Rotting plant debris in the soil from a diseased crop may also harbour the fungus.

Control.

The first precaution to be adopted in an endeavour to exclude these two diseases from a crop is in the choice of the seed-bed site. This should be on land that has not previously grown cabbages, cauliflowers or turnips and at some distance from land which has produced these crops; if this is not possible, then the soil should be sterilized by heat or chemical treatment. The next step is the adoption of some form of seed treatment in order to eliminate the possibility of introducing the diseases through the medium of infected seed, for in both cases the disease may be carried by the seed.

In the case of black rot, the bacteria causing the trouble are mainly carried externally on the seed-coat and these external bacteria can be dealt with by dipping in a corrosive sublimate solution at a strength of one in one thousand by weight. The seed is enclosed in a loosely-tied cheese cloth or muslin bag and immersed for half an hour, the bag being agitated to dislodge any air bubbles. The seed is then rinsed for five or ten minutes in several changes of clean water, dried in the shade and sown without delay.

This dipping, however, will not dispose of such black rot infection as may occur within the seed, and as the fungous parasite which causes black leg is carried within the seed the corrosive sublimate dipping will be quite ineffective in the case of the latter disease. Hence, even although black leg is much less frequently encountered than black rot, growers may prefer to use the hot water treatment in order to obtain a complete control of seed infection in the case of both diseases, even although it is not so easy of application as corrosive sublimate dipping.

The hot water treatment requires suspension of the seed in hot water for half an hour, the water being kept at 122 degrees Fahrenheit by means of a small flame, both the seed and the water being stirred from time to time. A thermometer costing approximately 5s. is required and the treatment can usually be carried out in a kerosene tin with a wooden lid in which two holes have been made. The thermometer can be inserted in one of these holes and the water and seed can be stirred through the other.

The hot water treatment kills the infection without harming the seed unduly, provided the seed had high vitality originally. Care must be taken to maintain the exact temperature for the stated time because too low a temperature will not kill the parasitic organisms, while too high a temperature will spoil the seed. After dipping, the seed is rinsed in clean, cold water, dried in the shade, and sown without delay.

* *Phoma lingam*.

Any diseased plants which may appear in the seed-bed in spite of the adoption of the above precautions should be discarded when transplanting, and, if infection is serious—a development which should not occur if the seed-bed precautions have been properly observed—consideration should be given to discarding the whole bed because even such plants as may appear healthy in a heavily infected bed, are nevertheless likely to be infected with the disease producing organisms.

As both diseases will remain in infected leaves, stalk butts and other debris left in the field after a crop has been harvested, all such debris should be gathered up and burned. Any diseased material unavoidably left unburned should be given an opportunity to decompose—thus killing out the disease producing organisms—by planting cabbages, cauliflowers, turnips or allied crops on the same land only once in every three or four years.

The Protection of Seed Potatoes from Tuber Moth Attacks.

J. HAROLD SMITH, Senior Research Officer.

THE wastage caused by the tuber moth* to potatoes in Queensland is considerable. Though the larvæ mine in the leaves and burrow into the stalk of the plant, their presence apparently does not affect the actual yield of tubers unless dry weather or poor cultural conditions slow down the rate of growth. Non-irrigated crops may suffer some reduction in yield, but irrigated crops grown on a well-prepared soil seldom show any appreciable ill effects, in so far as yield is concerned, from the infestation of leaves and stalks. In all crops, however, damage to the tubers may occur shortly before, or immediately after, harvesting begins. In the former case, the larvæ gain access to the tubers through cracks in the ground. Such attacks are particularly common in shallow rooting varieties, even when deep hilling and late-season waterings are carried out. When the crop is dug, some potatoes are already infested by the larvæ. Further attacks occur when harvesting takes place, for the larvæ leave the haulms and enter any tubers on the ground or in bags in the paddocks. The amount of damage to the tubers in all crops therefore depends on the extent of haulm injury, the variety, the cultural conditions, the incidence of disease and the efficiency or otherwise of harvesting methods. If the tubers are not immediately protected from further attacks when they are dug, the wastage will rapidly increase during storage until most, if not all, are destroyed. The damage to seed potatoes harvested in November and held on the farm for planting in February or March is particularly serious for the eyes may be completely destroyed.

There are several methods of protecting the tubers. If the crop is promptly harvested and the tubers are immediately removed from the field, a thick, straw covering will exclude the moths and keep the tubers in fair order. Some deterioration takes place during storage, however, for the potatoes will not be entirely free from the insect and populations can increase under the cover. Naphthalene liberally distributed in and among the tubers is also of some value for it keeps the moths away from them if the concentration of fumes is great enough.

* *Phthorimaea operculella* Zell.

Neither of the foregoing methods is particularly efficient, and heavy culling of the bulk is necessary when seed for the autumn crop is selected.* Much more efficient protection can be obtained by using derris dusts. These dusts are marketed by all firms dealing in insecticides and contain the ground roots of derris or allied plants mixed with talc or some other carrier. Tubers covered with a film of the dust are not attacked by the tuber moth and can be held in perfect condition for some months in moth infested premises. Treatment is a relatively simple matter. Two convenient methods are:—

- (a) Erect an 8 feet by 3 feet sloping bench from T. and G. timber with one end 6 inches higher than the other. Flanges extending 2 inches above the surface of the bench should be fitted at the sides and across part of the lower end in order to confine the tubers to the bench and feed them to the receiving bags. The surface of the bench is then covered with a one-eighth of an inch layer of derris dust. The tubers are tipped on to the bench at the upper end and worked down to the lower end by hand. As the tubers are rolling down the bench, additional dust is thrown over and worked on to them. The dusted tubers can be stored without further treatment until they are required. If the tubers are to be stacked unbagged, they can be fed direct from the bench to the stacking site.
- (b) The tubers can also be treated in kerosene tins. As the butts of mixed second grade and seed tubers are brought from the field to the barn, the potatoes are emptied into the tins and, after dust treatment, transferred to bags or the storage site. Three or four handfuls of derris dust are thrown into each kerosene tin as it is being filled and, when the tin is emptied, the dust swirls into a cloud which leaves a relatively good film on the surface of each tuber. If the seed tubers are selected during harvesting, they may be treated in the field as they are being bagged.

These and other methods of applying the dust to the potatoes all give efficient protection against tuber moth provided the coverage obtained is reasonably good. The dust should be freely used, particularly as any surplus left on the bench can be repacked and held for use at a later date. Treatment should preferably be carried out within twenty-four hours of harvesting; perhaps the best method is to dust the tubers at the close of each day's work in the field. Approximately 12 lb. to 15 lb. of dust will be needed for the treatment of each ton of seed potatoes.

Derris dusts are non-poisonous and can therefore be used with complete safety. Seed potatoes should always be treated. The dusts may also be used for the protection of table potatoes if these are harvested from heavily infested crops or liable to be stored for some time before reaching the market.

At the present time, derris dusts are available. However, should stocks run short, finely ground magnesite may be used as an alternative in exactly the same way as derris dusts. Magnesite gives quite good protection from tuber moth attacks if the potatoes are stored in dry weather. Under humid conditions, it is much less efficient than a derris dust, and it cannot therefore be depended on to protect seed potatoes held in moth infested premises during the summer months.



Post-War Planning for Dairy Farms.

C. R. TUMMON, Dairy Branch.

THERE is much talk at present of post-war planning and construction, and it is sincerely hoped that the dairy industry, and also the dairy farm, will feature largely in any new scheme. Young people should be encouraged to take on dairy work, which should be recognised as a very scientific business and one which may pay a handsome dividend if capably managed. The following suggestions are put forward as a possible guide to dairy farm planning—

Careful consideration should be given to planning the dairy, which, briefly, may provide for, as the main principles—

1. The layout and construction of buildings;
2. The farm;
3. The herd.

Layout and Construction of Dairy Premises.

Points to be considered in laying out and building dairy premises—

Selection of suitable site;

Build according to plan;

Concrete floors;

Good drainage;

Water supply;

Equipment—sterilizer, washing-up trough, and other necessary appliances and installations;

Dairy house;

Feed room and feeding stalls.

In selecting the site for dairy buildings, consideration should be given to distance from residence, suitable slope for drainage, and reasonably central position on the farm, in order to facilitate the working of the farm. The bails should be constructed on a slight slope so that in

rainy weather they will rapidly drain and dry. If practicable, bails should face north-east. The aspect may, however, vary according to direction of prevailing winds and rains in each dairy district.

Dairy premises should, of course, be constructed in conformity with Government regulations. These regulations are based on expert knowledge and only made law after they have proved successful in practice. When building the milking shed, it is advisable to provide the necessary air space for machines even if hand-milking is practised, so that no further alteration may be necessary if machines are installed later.

Floors of dairy buildings should be concreted, and, if practicable, the holding-yard as well.

The site and immediate surroundings should be well drained—a concrete drain extending 30 feet from bails is suggested. A narrow concreted race leading away from the bails so that the cows may walk along this after leaving the shed also is advised. This race should run along the front of the milking shed and extend some distance from the shed. If such a race is provided, all the bail doors should open the one way so that the cows can walk out in only one direction.

An ample water supply at the dairy is a very important factor in the production of high-quality dairy products. With plenty of water available, there is no difficulty in observing the required standard of cleanliness of utensils, equipment, and the milking-shed floor.

The installation of a sterilizer is compulsory if milking machines are in use, and is also recommended if hand-milking is practised. With a sterilizer and suitable washing-up trough and draining rack provided, all utensils may be thoroughly cleansed, sterilized, and dried.

A cool, well-constructed, and well-ventilated dairy house is required for the keeping of cream on the farm. It is now permissible for this dairy house to be constructed as an annex to the separator room. This is a saving in expense and makes working more convenient.

Hand-feeding should be practised on every farm where maximum production is required, and it is therefore necessary to have suitable feeding stalls, feed room, and silo in the proximity of other dairy buildings.

The Farm.

Points for consideration in the planning of the layout of a dairy farm are:—

- Subdivision;
- Stock-proof fences and well-made and well-hung gates;
- Pastures;
- Pasture improvement;
- Shade and water;
- Cultivation;
- Fodder conservation.

To get the best out of the pastures, the farm should be subdivided into a number of small paddocks, which should contain a variety of grasses. This enables one paddock to be eaten down at a time (known as rotational grazing), prevents pasture destruction by unnecessary

walking by cattle, and provides for the systematic spelling of the paddocks. Also, if several grasses are provided in separate paddocks, they provide variety in feed for the herd. Calf paddocks and a bull paddock and serving yard should also be situated close to the dairy buildings. The bull should always be kept in a bull paddock, so that calving may be controlled on the farm and proper supervision kept over the bull. A crush is indispensable on every dairy farm. Separate isolation paddocks for cows and pigs also are required, in order that any sick animal may be isolated for observation and the risk of spreading infection minimised.

Well-made and well-hung wooden swing gates are a definite asset on any dairy farm. It has often been said that a farmer may be judged by the type of gates on his farm.

When laying down pasture, the grasses chosen should be those which grow well and are otherwise suitable to district conditions. Some grasses are adaptable to certain climates only, and it is no use persevering with them in localities where climatic conditions are not suitable for those particular species.

After pastures have been established for some time, it may be observed that, generally, they decline gradually in value from year to year. This is an indication that renovation is necessary and an effort should be made to improve them. Often fertilizing will restore them to better growth; and where grasses (such as *paspalum*) become rootbound, it will be found very beneficial if the pasture is broken up, either by ploughing, harrowing, or some such method.

It is a good plan to provide, if practicable, adequate shade and water in each of the paddocks on the farm. Cattle need protection from the mid-day heat in summer, and water should be available to cattle whenever they have the inclination to drink. These factors influence the milk yield considerably.

The practice of depending on grasses alone is not conducive to continuous high milk yields. Land should be cultivated, where practicable, and crops grown to feed the milking herd during the drier periods of the year so that a high rate of production may be maintained throughout the year.

As well as providing crops which may be fed off in the growing stage, it also is sound dairy practice to provide for fodder storage. A silo, therefore, is regarded as a necessity on every dairy farm. Various silo types are discussed and particulars of the construction given in *The Queensland Agricultural and Pastoral Handbook*, volume I. The stacking of hay is a cheap and useful method of conserving fodder.

The Herd.

In establishing a dairy herd, the best foundation stock available should be obtained. Points to be considered are:—

Selection of breed;

Methods of improving production;

Maintenance of health in the herd.

After deciding the breed of dairy cattle he prefers, the farmer's aim should be to gradually work up to a uniform type of high-producing animals. All breeds of dairy cattle have their desirable and undesirable characteristics, and in these notes there is no attempt to influence any farmer in his choice of any particular breed. However, if practicable, cross-bred animals should not be selected, because, although they themselves on the first cross are quite likely to be excellent producers, their progeny more often than not are not up to the same standard.

Improved production may be brought about by concentrating on the following factors:—Feeding, breeding, testing, and culling. No matter how well bred a dairy herd may be, the highest milk yield cannot be obtained if the necessary food to make the milk is unavailable to the cows. The natural pastures are usually sufficient for the herd's requirements during the warm, wet months of the year. During winter and dry periods of the year, however, an ample supply of conserved fodder should be available for feeding the dairy herd. This not only keeps up maximum yields throughout the year, but also keeps the herd in good condition, of which the advantages are obvious.

It should be recognised that the bull is the most important animal in the herd. As half of the bull's breeding is inherited by the progeny, it is quite evident why this animal is so important. Because of this, therefore, no effort or expense should be spared in obtaining a suitable, well-bred sire for the herd. As only experienced breeders can afford to practice in-breeding, this is not recommended to the average farmer. Frequent changes in sires are required therefore, but the successive sires used should belong to one blood line, in order to attain uniformity of type in the herd. It is useless trying to select the best cows in the herd from which to breed, unless their capacity for production has been estimated by the Babcock test. Every farmer should test his cows systematically for butter-fat production and eliminate gradually those giving the lowest yield, retaining calves only from cows of high production and suitable type.

The farmer should always be on the lookout for sickness or disease among his herd. When an animal is observed to be sick, it should be separated from the rest of the herd, in case the sickness is of a contagious nature. It is wise for the farmer to acquire a knowledge of treatment of the most common ailments of stock. Care should be exercised when introducing any fresh stock to the herd, to ensure that only healthy animals are purchased. A veterinary first-aid chest is desirable on every farm. It should contain at least two clinical thermometers, inoculating syringe and needle, large syringe, drenches, and a few other essential veterinary requisites.

It is not suggested that all the planning as outlined could be put into effect in a short time, but it is hoped that farmers will keep this in mind as an aim which they should endeavour to attain as quickly as possible if they intend to make their work a pleasure and dairying more profitable business.

Queensland Butter Production, 1943-44.

E. B. RICE.

THE accompanying tables cover the operations of all butter factories for the year ended 30th June, 1944. The information contained therein has been compiled and tabulated from monthly returns in accordance with the requirements of *The Dairy Produce Act*.

A scrutiny of the figures indicates the quantity of butter in each grade made by the respective factories, and the quantity of butter in each grade for which suppliers were paid. The official gradings columns indicate the results of the gradings of butter examined officially by both Commonwealth and State officers. The information contained in these tables is of particular interest to suppliers, as well as to factory managements and directorates.

SUMMARY OF PRODUCTION AND GRADINGS OF BUTTER FOR THE YEAR ENDED 30TH JUNE, 1944.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
101,416,297	67,537,899	30,897,327	2,922,282	58,789

PAY IN LB.

101,696,921	69,398,737	29,870,469	2,410,717	16,998
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OVER-RUN.

Actual	2,852,392 = 2.89%
Paid	3,133,016 = 3.08%

GRADINGS IN BOXES.

Submitted as :—

Choice.	Choice.	First.	Second.	Pastry.
847,265	680,597	165,859	752	57
..	80.32%	19.57%	.08%	.03%
First				
418,898	..	407,389	11,418	91
		97.24%	2.72%	.04%
Second.				
52,846	..	..	47,150	5,696
	..	..	89.24%	10.76%
<hr/> 1,319,009	<hr/> 680,597	<hr/> 573,248	<hr/> 59,320	<hr/> 5,844.
	51.6%	43.4%	4.4%	.6%

Percentage of Production Graded = 72.84%

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED
30TH JUNE, 1944

Factory.	Manufacture and Payments in Lb.						Overrun.		Make Graded. Per Cent.
	Total.	Choice.	First.	Second.	Pastry.		Actual.	Paid.	
Atherton ..	Make 1,379,655 Pay 1,381,377	1,379,655 1,381,377	.. ..	.. ..	.. ..		46,078 3.45%	47,800 3.58%	..
Bushy Creek ..	Make 55,102 Pay 55,142	.. ..	55,102 55,142	.. ..	.. ..		851 1.57%	891 1.64%	..
Caboolture ..	Make 2,228,526 Pay 2,228,509	1,978,672 2,007,331	243,421 212,627	6,433 8,551	.. ..		73,859 3.43%	73,842 3.43%	78.04
Eumundi ..	Make 2,107,575 Pay 2,105,573	1,915,115 1,954,187	186,773 148,631	5,687 2,755	.. ..		65,730 3.22%	63,728 3.12%	95.04
Pomona ..	Make 1,556,385 Pay 1,556,506	1,414,283 1,457,227	138,548 97,011	3,554 2,268	.. ..		37,526 2.47%	37,647 2.47%	92.31
Chinchilla ..	Make 1,781,213 Pay 1,779,054	1,233,309 1,273,235	459,424 447,656	83,720 58,163	4,760 ..		45,783 2.63%	43,624 2.51%	92.57
Daintree ..	Make 126,144 Pay 126,110	29,882 29,054	96,262 97,056	.. ..	.. ..		2,749 2.22%	2,715 2.20%	..
Dayboro' ..	Make 93,084 Pay ..	.. ..	93,084 ..	.. ..	.. ..		.. ..	.. ..	44.4
Toowoomba ..	Make 2,328,807 Pay 2,336,368	1,796,247 1,787,897	468,496 486,025	64,064 62,446	.. ..		64,907 2.86%	71,468 3.15%	48.18
Clifton ..	Make 1,201,872 Pay 1,202,064	871,640 868,793	325,640 328,599	4,592 4,672	.. ..		30,280 2.58%	30,452 2.59%	84.50

OFFICIAL GRADINGS IN BOXES.

Factory.	Submitted as Choice.					Submitted as First.				Submitted as Second.		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Atherton ..	..	..	..	..	..	..	..	..	..	..	..	..
Bushy Creek	..	..	..	..	..	..	..	..	..	..	..	..
Caboolture	27,078	25,980 95.94%	1,098 4.06%	..	..	3,913	2,385 60.95%	1,528 39.05%	..	67	60 89.55%	7 10.45%
Eumundi ..	32,025	16,641 51.96%	15,384 48.04%	..	..	3,594	3,032 84.36%	562 15.64%	..	149	149 100.0%	..
Pomona ..	23,062	20,227 87.707%	2,835 12.29%	..	..	2,456	2,184 88.92%	272 11.08%	..	137	85 62.04%	52 37.96%
Chinchilla ..	20,017	9,458 47.24%	10,559 52.76%	..	..	7,916	7,445 94.05%	471 5.95%	..	1,511	1,047 69.29%	464 30.71%
Daintree ..	..	..	..	..	..	..	..	..	..	..	..	..
Dayboro' ..	739	..	716 96.88%	23 3.12%	..	..	..	..	..	..	..	..
Toowoomba	9,962	9,951 99.88%	11 .12%	..	..	8,186	8,142 99.46%	44 .54%	..	969	956 98.66%	13 1.34%
Clifton ..	12,701	12,292 96.78%	409 3.22%	..	..	5,334	5,334 100.0%	..	..	101	70 69.306%	31 30.69%

PRODUCE ON, PAYMENTS, AND GRADINGS OF BUTTER QUEENSLAND, FOR THE YEAR ENDED
30TH JUNE, 1944 *cont*

Factory.	Manufacture and Payments in Lb.						Overrun.		Make Graded. Per Cent.
	Total.	Choice.	First.	Second.	Pastry.		Actual.	Paid.	
Crow's Nest	Make Pay 1,530,480 1,530,493	1,226,344 1,226,265	243,544 243,590	60,592 60,638	.. ..		44,606 3.0%	44,619 3.0%	94.75
Dalby	Make Pay 2,983,138 2,982,128	1,519,802 1,513,953	1,394,904 1,408,833	68,432 59,342	.. ..		91,532 3.16%	90,522 3.13%	93.38
Goombungee	Make Pay 1,587,712 1,587,793	778,848 778,211	806,792 807,582	2,072 2,000	.. ..		55,004 3.58%	55,085 3.59%	96.87
Jandowae	Make Pay 2,283,008 2,283,032	1,354,696 1,359,797	909,496 904,894	18,816 18,341	.. ..		75,867 3.43%	75,891 3.43%	88.58
Miles	Make Pay 1,125,488 1,125,764	166,320 167,572	903,056 904,880	56,112 53,312	.. ..		41,648 3.84%	41,924 3.86%	85.03
Esk	Make Pay 2,036,274 2,036,034	1,028,542 1,028,749	943,259 950,432	64,473 56,853	.. ..		69,247 3.52%	69,007 3.5%	86.42
Evelyn	Make Pay 147,475 148,058	147,475 148,058	.. ..	.. ..	.. ..		2,233 1.53%	2,816 1.92%	..
Gayndah	Make Pay 1,624,051 1,624,489	1,407,611 1,393,607	200,648 215,909	15,792 14,973	.. ..		66,679 4.28%	67,117 4.3%	46.8
Killarney	Make Pay 1,232,479 1,231,210	715,400 714,166	458,450 472,429	58,629 44,615	.. ..		27,859 2.31%	26,590 2.2%	59.88
Logan and Albert	Make Pay 2,934,474 2,934,658	2,516,322 2,546,185	418,152 386,984	.. 1,489	.. ..		89,865 3.15%	90,049 3.16%	94.31

OFFICIAL GRADINGS IN BOXES—continued.

Factory.	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.
Crow's Nest ..	20,523	17,718 86.33%	2,798 13.63%	7 -03%	..	4,327	4,089 94.49%	238 5.51%	..	1,045
Dalby ..	24,891	23,257 93.43%	1,613 6.48%	21 -09%	..	23,658	23,404 98.92%	254 1.08%	..	1,197
Goombungee ..	13,133	11,417 86.93%	1,716 13.07%	..	..	14,294	14,279 99.89%	15 -11%	..	37
Jandowae ..	19,984	17,686 88.50%	2,275 11.38%	23 -11%	..	15,847	15,721 99.204%	126 -79%	..	283
Miles ..	1,709	1,536 89.87%	173 10.13%	..	..	14,116	14,116 100.0%	..	..	1,002
Esk ..	18,179	15,494 85.23%	2,685 14.77%	..	..	12,104	11,985 99.01%	119 -99%	..	1,142
Evelyn ..	..	..	..	..	..	..	..	..	..	..
Gayndah ..	9,930	8,946 90.09%	984 9.91%	..	..	3,340	3,072 91.97%	268 8.03%	..	303
Killarney ..	5,060	2,720 53.75%	2,340 46.25%	..	..	7,188	7,179 99.87%	9 -13%	..	930
Logan and Albert ..	42,055	36,780 87.45%	5,251 12.48%	24 -07%	..	7,365	6,823 92.65%	542 7.35%	..	..

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED
30TH JUNE, 1944—continued.

Factory.	Manufacture and Payments in Lb.					Overrun.		Make Graded. Per Cent.
	Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	
Maleny	Make 2,339,166	2,281,766	57,400	..	..	70,972	71,629	91.56
	Pay 2,339,823	2,292,332	46,624	867	..	3.12%	3.15%	
Maryborough	Make 870,836	590,320	260,433	20,083	..	21,543	22,296	..
	Pay 871,589	587,898	263,511	20,180	..	2.53%	2.62%	
Biggenden	Make 1,878,407	1,508,079	370,328	..	..	70,711	67,204	42.24
	Pay 1,874,900	1,558,264	316,590	46	..	3.91%	3.71%	
Kingaroy	Make 3,854,318	3,744,166	..	110,152	..	200,316	200,052	31.48
	Pay 3,854,054	3,766,783	..	87,271	..	5.48%	5.47%	
Mundubbera	Make 2,612,968	2,379,224	195,048	38,696	..	104,378	105,123	70.94
	Pay 2,613,713	2,411,636	176,612	25,465	..	4.16%	4.19%	
Wondai	Make 2,459,205	1,940,563	464,072	54,570	..	89,620	90,586	71.69
	Pay 2,460,171	1,984,780	441,317	34,074	..	3.78%	3.82%	
Millea Millaa	Make 501,658	500,202	..	1,456	..	12,227	10,768	..
	Pay 500,199	498,759	..	1,440	..	2.49%	2.2%	
Milnerran	Make 1,301,821	190,368	778,151	299,478	33,824	30,991	31,136	85.95
	Pay 1,301,966	257,934	779,084	264,948	..	2.43%	2.45%	
Nanango	Make 2,220,324	868,204	1,281,672	70,448	..	70,347	70,250	50.71
	Pay 2,220,227	1,214,971	964,033	41,223	..	3.27%	3.26%	
Oakey	Make 3,379,256	2,610,376	534,576	232,120	2,184	113,208	110,313	94.09
	Pay 3,376,361	2,617,756	568,227	190,378	..	3.46%	3.37%	

OFFICIAL GRADINGS IN BOXES—continued.

Factory.	Submitted as Choice.						Submitted as First.				Submitted as Second.		
	Total.	Choice.	First.	Second.	Pastry.		Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Maleny ..	37,220	27,907 74.97%	9,313 25.03%	..	..		1,025	992 96.77%	33 3.23%	..	..	..	..
Maryborough ..	..	..	..	..	..		378	305 80.68%	73 19.32%	..	267	65 24.34%	202 75.66%
Biggenden ..	7,806	5,940 76.09%	1,866 23.91%	..	..		6,364	5,850 91.92%	514 8.08%	..	..	..	..
Kingaroy ..	19,769	19,581 99.05%	188 .95%	..	..		187	78 41.71%	109 58.29%	..	1,711	1,546 90.35%	165 9.65%
Mundubbera ..	28,854	25,621 88.79%	3,233 11.21%	..	..		3,493	2,545 72.86%	897 25.68%	51 1.46%	752	661 87.89%	91 12.11%
Wondai ..	22,371	15,112 67.54%	7,259 32.46%	..	..		8,310	7,588 91.31%	722 8.69%	..	801	720 89.88%	81 10.12%
Millaa Millaa ..	..	..	..	..	..		..	..	..	..	..	..	..
Milmerran ..	1,852	555 29.96%	1,297 70.04%	..	..		12,334	12,012 97.38%	332 2.62%	..	5,795	4,855 83.78%	940 16.21%
Nanango ..	13,081	10,194 77.92%	2,816 21.52%	36 .28%	35 .28%		16,241	15,706 96.705%	495 3.04%	40 .25%	1,277	1,033 80.89%	244 19.11%
Oakey ..	41,499	33,534 80.806%	7,965 19.194%	..	..		8,185	8,185 100.0%	..	..	4,095	4,056 99.04%	39 .96%

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED
30TH JUNE, 1944—continued.

Factory.	Manufacture and Payments in Lb.						Overrun.		Make Graded.
	Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Per Cent.	
Gladstone	Make 1,505,665 Pay 1,507,370	467,029 486,042	1,015,789 1,003,687	22,847 17,580	.. 61	31,059 2.1%	32,764 2.22%	73.97	
Biloela	Make 3,361,062 Pay 3,361,664	1,173,411 1,172,263	2,114,913 2,136,039	72,738 53,362	.. ..	111,078 3.41%	111,680 3.43%	50.01
Bundaberg	Make 1,877,657 Pay 1,883,117	666,403 674,983	1,198,410 1,192,909	12,844 15,192	.. 33	33,835 1.83%	39,295 2.13%	54.21	
Mackay	Make 634,691 Pay 662,808	226,044 248,591	391,178 398,261	.. ..	17,469 15,956	U/r 5,822 -91%	22,295 3.48%	..
Monto	Make 3,921,096 Pay 3,921,868	1,518,155 1,533,844	2,289,616 2,290,543	113,325 97,481	.. ..	85,625 2.23%	86,397 2.25%	72.35
Rockhampton	Make 1,738,406 Pay 1,746,355	222,759 238,427	1,450,693 1,454,000	64,954 53,928	.. ..	41,978 2.47%	49,927 2.94%	..
Wowan	Make 2,485,430 Pay 2,486,141	860,588 857,689	1,564,953 1,579,057	59,889 49,395	.. ..	66,196 2.73%	66,907 2.76%	46.96
Q.A.H.S.	Make 52,080 Pay 78,830	36,624 74,797	15,456 3,735	.. 298	.. ..	U/r 25,245 3.26%	1,505 1.94%	44.52
Booval	Make 3,081,313 Pay 3,083,621	1,986,067 1,858,238	926,322 1,101,593	168,700 123,790	224 ..	81,461 2.81%	86,769 2.89%	57.92	
Boonah	Make 3,364,195 Pay 3,364,105	2,081,496 2,159,939	1,175,086 1,128,038	107,613 76,128	.. ..	123,139 3.79%	123,049 3.79%	93.16

OFFICIAL GRADINGS IN BOXES—continued.

Factory.	Submitted as Choice.						Submitted as First.				Submitted as Second.		
	Total.	Choice.	First.	Second.	Pastry.		Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Gladstone ..	4,783	4,491 93.89%	292 6.1%	..	..	14,199	14,159 99.72%	40 .28%	..	..	907	895 98.68%	12 1.32%
Biloela ..	6,151	6,067 98.63%	84 1.36%	..	..	22,692	22,366 98.56%	326 1.43%	..	..	1,174	1,124 95.74%	50 4.26%
Bundaberg ..	3,111	2,833 91.06%	278 8.94%	..	..	14,769	14,769 100.0%	..	..	..	296	296 100.0%	..
Mackay ..	..	..	..	..	..	..	..	..	..	..	125	..	125 100.0%
Monto ..	18,047	17,847 98.89%	200 1.11%	..	..	39,604	29,880 97.63%	724 2.36%	..	..	2,006	1,931 96.26%	75 3.74%
Rockhampton ..	..	..	..	..	..	71	71 100.0%	..	..	..	1,017	342 33.63%	675 66.37%
Wowan ..	4,272	4,227 98.95%	45 1.05%	..	..	15,459	15,432 99.82%	27 .17%	..	..	1,110	1,093 98.47%	17 1.53%
Q.A.H.S. ..	138	34 24.63%	100 72.46%	4 2.91%	..	276	276 100.0%	..	..	..	..	..	..
Booval ..	14,271	8,600 60.26%	5,671 39.74%	..	..	14,316	14,023 97.95%	293 2.05%	..	..	3,285	2,304 70.13%	981 29.87%
Boonah ..	32,278	15,849 49.101%	16,080 49.82%	349 1.07%	..	21,151	20,927 98.94%	224 1.06%	..	..	2,535	2,433 95.97%	102 4.03%

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED
30TH JUNE, 1944—continued.

Factory.	Manufacture and Payments in Lb.						Overrun.		Make Graded. Per Cent.
	Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.		
Grantham ..	Make 2,065,407 Pay 2,065,403	1,502,837 1,546,123	452,138 426,151	110,432 93,129	.. ..	71,865 3.6%	71,861 3.6%	92.05
Laidley ..	Make 1,792,146 Pay 1,792,118	1,335,075 1,339,367	416,270 418,571	40,801 34,180	.. ..	58,088 3.34%	58,060 3.34%	95.71
Lowood ..	Make 704,501 Pay 704,548	260,415 250,004	399,304 411,997	44,782 42,547	.. ..	22,260 3.26%	22,307 3.26%	85.11
Roma ..	Make 836,115 Pay 836,199	.. 226,960	590,723 400,005	245,392 209,111	.. 123	30,004 3.72%	30,088 3.73%	55.04	
Silkwood ..	Make 34,685 Pay 34,760	.. ..	34,357 33,935	.. ..	328 825	U/r .21%	.. ..	..
Murgon ..	Make 2,597,837 Pay 2,597,489	1,718,469 2,069,444	876,008 526,243	3,360 1,802	.. ..	84,204 3.34%	83,856 3.33%	80.41
Proston ..	Make 1,334,587 Pay 1,335,097	983,411 1,018,342	326,480 295,899	24,696 20,856	.. ..	29,582 2.26%	30,092 2.3%	93.27
Kingston ..	Make 4,166,792 Pay 4,165,900	2,537,248 2,646,149	1,428,000 1,364,797	201,544 154,954	.. ..	126,287 3.12%	125,395 3.1%	91.96
Woodford ..	Make 1,435,775 Pay 1,436,271	1,259,411 1,246,843	176,364 189,428	.. ..	.. ..	30,956 2.2%	31,452 2.24%	94.34
Warwick ..	Make 1,742,335 Pay 1,741,256	1,278,467 1,204,863	386,713 469,426	77,155 66,967	.. ..	47,675 2.81%	46,596 2.74%	54.35

OFFICIAL GRADINGS IN BOXES—continued.

Factory.	Submitted as Choice.					Submitted as First.				Submitted as Second.		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Grantham ..	24,249	9,171 37.82%	15,078 62.18%	..	..	7,719	7,400 95.86%	319 4.14%	..	1,982	1,950 98.38%	32 1.62%
Laidley ..	22,526	18,220 80.88%	4,306 19.12%	..	..	7,339	7,251 98.8%	88 1.2%	..	764	707 92.53%	57 7.47%
Lowood ..	3,750	2,952 78.72%	798 21.28%	..	..	6,452	6,370 98.72%	82 1.28%	..	505	505 100.0%	..
Roma ..	85	..	85 100.0%	..	..	3,751	3,723 99.25%	28 .75%	..	4,382	4,354 99.36%	28 .64%
Silkwood ..	..	..	..	..	..	..	..	..	..	..	..	..
Murgon ..	24,705	18,816 76.16%	5,889 23.84%	..	..	12,511	12,439 99.42%	72 .58%	..	86	79 91.86%	7 8.14%
Proston ..	17,062	10,139 59.43%	6,827 40.01%	96 .56%	..	4,726	4,551 96.29%	175 3.71%	..	441	420 95.23%	21 4.77%
Kingston ..	46,382	40,197 86.66%	6,185 13.34%	..	..	18,608	18,438 99.08%	170 .92%	..	3,433	3,414 99.45%	19 .55%
Woodford ..	21,729	13,605 62.61%	8,124 37.39%	..	..	2,460	2,437 99.07%	23 .93%	..	..	..	..
Warwick ..	9,017	7,226 80.13%	1,700 18.86%	91 1.02%	..	6,483	6,380 98.41%	103 1.59%	..	1,411	1,324 93.83%	87 6.17%

PRODUCTION, PAYMENTS, AND GRADINGS OF BUTTER IN QUEENSLAND, FOR THE YEAR ENDED
30TH JUNE, 1944—continued.

Factory.	Manufacture and Payments in Lb.						Overrun.		Make Graded.
	Total.	Choice.	First.	Second.	Pastry.		Actual.	Paid.	
Allora	Make Pay 1,398,196 1,398,801	1,149,268 1,151,591	244,662 242,075	4,266 5,135	.. ..		38,946 2.86%	39,551 2.9%	60.79
Inglewood ..	Make Pay 483,941 484,339	217,157 190,812	189,392 219,667	.. 73,860	.. ..		15,171 3.23%	15,569 3.32%	78.65
Texas	Make Pay 286,997 287,053	214,788 164,398	42,081 94,368	30,128 28,287	.. ..		9,561 3.44%	9,617 3.46%	..
Cooroy	Make Pay 1,736,928 1,737,336	1,283,104 1,396,421	441,056 333,158	12,768 7,757	.. ..		55,896 3.32%	56,304 3.34%	93.94
Gympie	Make Pay 7,017,559 7,016,996	6,466,242 6,583,378	464,632 364,950	86,685 68,668	.. ..		177,099 2.59%	176,536 2.58%	93.83

OFFICIAL GRADINGS IN BOXES—*continued*.

Factory.	Submitted as Choice.						Submitted as First.				Submitted as Second.		
	Total.	Choice.	First.	Second.	Pastry.	Total.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Allora ..	10,247	7,252 70.77%	2,995 29.23%	..	..	4,863	4,863	4,632 95.24%	231 4.76%	..	69	69 100.0%	..
Inglewood ..	1,825	1,435 78.63%	390 21.37%	..	..	3,704	3,704	3,639 98.24%	65 1.76%	..	1,268	1,115 87.93%	153 12.07%
Texas ..	..	..	..	..	..	757	757	702 92.73%	55 7.27%	..	448	373 83.25%	75 16.75%
Cooroy ..	21,146	17,859 84.45%	3,187 15.07%	78 .3%	22 .18%	7,748	7,748	7,748 100.0%	..	..	243	203 83.53%	40 16.47%
Gympie ..	107,991	105,230 97.44%	2,761 2.56%	..	..	8,085	8,085	7,325 90.59%	760 9.41%	..	1,510	1,117 73.97%	393 26.03%

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society. Production records for which have been compiled during the month of September, 1944 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.		Butter Fat.	Sire.
		Lb.	Lb.		
AUSTRALIAN ILLAWARRA SHORTHORNS.					
SENIOR, 3 YEARS (STANDARD 290 LB.).					
Jamberoo Reddy 7th	M. J. Brosnan, Clifton	9,139.75	368.181	Greyteigh Vallant	
JUNIOR, 3 YEARS (STANDARD 270 LB.).					
Alkavale Model 19th	W. H. Thompson, Nanango	11,655.25	541.326	Penrhos Pansy's Pride	
Alkavale Model 20th	W. H. Thompson, Nanango	9,978.0	407.906	Penrhos Pansy's Pride	
Alkavale Judy 11th	W. H. Thompson, Nanango	9,448.5	361.157	Reward of Fairfield	
JUNIOR, 2 YEARS (STANDARD 230 LB.).					
Alkavale Model 23rd	W. H. Thompson, Nanango	10,203.6	434.988	Penrhos Pansy's Pride	
Buaya View Duchess	W. Caldwell, Bell	7,283.8	318.491	Trevor Hill Reflection	
JERSEY.					
JUNIOR, 4 YEARS (STANDARD 310 LB.).					
Strathdean Dora	S. H. Caldwell, Bell	4,931.0	315.403	Navua Ladora's Ruler	
SENIOR, 3 YEARS (STANDARD 290 LB.).					
Kathleigh Shamrock	W. Greisheimer, Leyburn	6,049.65	346.696	Retford King's Thorn	
Kathleigh Lady Bell	W. Greisheimer, Leyburn	6,869.55	340.559	Banyule Senor	
Strathdean Rosie (188 days)	S. H. Caldwell, Bell	4,570.6	304.565	Navua Ladora's Ruler	
JUNIOR, 3 YEARS (STANDARD 270 LB.).					
Strathdean Daffodil (247 days)	S. H. Caldwell, Bell	5,746.39	362.374	Langside Pattibelle Dreamer 2nd	
SENIOR, 2 YEARS (STANDARD 250 LB.).					
Strathdean Fortune (248 days)	S. H. Caldwell, Bell	4,950.46	311.39	Navua Ladora's Ruler	
Belgarth Opal 4th	D. B. Hutton, Cunningham	4,990.0	290.584	Carnation Fairlad	
JUNIOR, 2 YEARS (STANDARD 230 LB.).					
Hocknell Walmafe Babette	N. C. Webb, Reauesdort	6,599.3	331.779	Hocknell Golden Surprise	



Economies in Production.

R. E. SYMES, Poultry Inspector.

THERE are instances of errors in management which are so noticeable that with a little perception they may be detected and promptly remedied.

What is required is a keen sense of observation which may be acquired by perseverance, so that the simpler sources of loss may be observed and eliminated. The ability to develop this faculty is one of the principal factors in determining the success or failure in poultry raising.

Food Wastage.

The most important problem of the poultry raiser to-day is that of fodder. No one can afford to waste or misuse the limited supplies available.

One of the principal forms of wastage which can easily be corrected is that caused by the use of badly-constructed feed hoppers. The spilling of mash from hoppers is not only the cause of loss of much of the food, but what is spilt becomes contaminated and this contaminated food is often the source of spread of infection when consumed by birds. Farmers who notice wastage from their hoppers and who desire to replace them with more efficient types may obtain from the Department of Agriculture illustrations of suitable feeding equipment.

The foodstuffs which are available should be used for the feeding of the best layers; it is necessary, therefore, to cull. Some poultry farmers regard culling as a duty which should be performed, at least, once annually. Every non-producer represents a waste and it is essential to be on the lookout continuously for possible sources of loss of profit. Culling, therefore, should be a continuous practice performed regularly and ruthlessly. Any bird which does not come into lay within seven months has either been badly reared or is lacking in the capacity for profitable egg production. Culling was dealt with in the October Journal.

Another big wastage of food can be caused by rats. With large quantities of food easily reached, the rat finds the poultry farm an ideal hunting ground. If poultry farmers could only be shown the enormous losses caused by rodents they would take effective steps to

exterminate them. When putting down concrete floors for poultry houses, a wall 5 inches thick and extending down to at least 24 inches below ground level should be constructed, so that rats cannot burrow under the floor to colonise there. The building of sheds which have hardwood floors on stumps is also a way of reducing the possibility of harbouring rats. If rats are found in the feed shed, no effort should be spared to trap or otherwise exterminate them.

If conditions on a poultry farm are such that food wastage caused by faulty hoppers or rats cannot be prevented by the construction of different types of hoppers or the extermination of rats, then the poultry raiser is recommended to change his system of feeding to that of wet mash and grain. With this system, the only food available to rats will be confined to a feed shed where the rats may be more easily dealt with.

Other Causes of Loss.

Other causes of loss are broken eggs and deterioration in quality. The number of eggs which do not reach the market because of breakage has a marked effect on the income of the farmer. Frequent collection of eggs will save losses through breakage, and also enable quick detection of broodies which should be immediately removed. Collecting the eggs as frequently as possible also reduces the risk of staining of eggs through contact with excreta and other material. The method of construction and location of nests also has a bearing on the cleanliness and absence of breakage of eggs. Nests should be deep and the entrance only sufficiently wide to enable birds to enter without difficulty. They should face away from the light. Birds like quietness and darkness when they are laying; if the nests are so arranged, the pullets will take to them naturally instead of laying on the floor with the almost certain loss of eggs through breakage. The nests should be filled to a depth of 3 inches with shell grit, shavings, straw or some other suitable litter. Among white leghorns, the trouble of broken eggs through broodies monopolising the nests is not so great as is the case with some heavy breeds. Careful breeding of Australorps has gone a long way towards eliminating the broody tendency, but some strains still exhibit this characteristic. Unless the broody hen is promptly removed from the nest, there is sure to be some jostling by other birds anxious to enter the nest, and during the dispute as to occupation rights some eggs will undoubtedly become broken. This is the signal for all birds in the vicinity to rush in to eat, if they can, the broken egg.

Parasitic infestation is another source of leakage of profits. Worms are often found in pullets and other young stock. Usually, they are not in sufficient numbers to seriously affect the health of the bird, but they do tend to lower their resistance to disease. In some cases, however, fowls are so badly infested that worms are responsible for heavy losses and some mortality. In such cases treatment is necessary. Infestation is acquired from floors and yards which have become contaminated with eggs which have developed to the infective stage. All floors and yards should be kept clean and dry. Worm infestation is most likely from yards in damp situations. Where birds are allowed out of the house, care should be taken that the ground is well drained.

One of the advantages of the intensive system is the reduced liability to trouble from worm infestation, as compared with flocks which are permitted to run in yards.

Fowl pox is another preventable loss. Many poultry farmers are troubled every year with outbreaks of fowl pox among their birds. Fowl pox is not usually a serious disease from the point of view of actual number of deaths which occur, but it does have a serious effect on the condition of the growing stock which it attacks. Even a mild infection causes birds to become indifferent to food and usually brings about a false moult and so egg production is delayed. Fowl pox is preventable, so this is a cause of loss which can be definitely stopped. If chickens are vaccinated with fowl pox vaccine at an early age, they will become immune to chickenpox and much disappointment will be saved the raiser of young stock. As an insurance against wastage from this disease vaccination is suggested.

Overcrowding of chickens is another source of serious losses each year. If it were possible to ascertain the number of pullets raised in comparison with the number of chicks produced, it would provide a startling illustration of one of the ways in which poultry profits are lost. While a lot of chicken losses are caused by coccidiosis or pullorum disease, a very large proportion of the losses are directly caused by overcrowding. Crowding in the brooder house, around the hover, or at the drinking fountain or feed troughs, means stunted growth as the jostling and squeezing does not give some of the chickens a chance. Colds among chickens nearly always result from crowded conditions. There should be enough hoppers to permit all chicks to feed in comfort, and it should be remembered that the chicks are growing rapidly and every week require more room.

RECENT PUBLICATIONS.

THE QUEENSLAND AGRICULTURAL AND PASTORAL HANDBOOK—

Vol. I.—Farm Crops and Pastures **Price, 5s., Post Free**

Vol. II.—Horticulture **Price, 4s., Post Free**

BOTANY FOR QUEENSLAND FARMERS **Price, 2s., Post Free**

FOR FREE DISTRIBUTION:

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Wheat and Maize.
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Winter and Spring Fodder Crops.

Common Farm and Pasture Weeds.
Pasture Establishment, Management, and
General Improvement.
The Home Vegetable Garden.
Soils, Fertilizers, and Manures.
Farm Bookkeeping.

Enquiries for advisory literature on other subjects would be welcomed.

Because of paper restrictions, inquirers are requested to apply only for the publications they actually need.

All applications for departmental publications should be addressed to **The Under Secretary, Department of Agriculture and Stock, Brisbane.**

ANIMAL HEALTH

Fowl Pox.

L. G. NEWTON.

A HIGHLY infectious disease of poultry, fowl pox, occurs in practically all parts of Queensland where poultry is kept. It is known also as roup, chicken pox, bird pox, contagious epithelioma, diphtheritic roup, canker, avian diphtheria, and warts.

Cause and Nature of the Disease.

Fowl pox is caused by a virus—an organism so small that it cannot be seen even with the aid of a microscope.

The lesions of fowl pox are of three different types, the typical and common one being wart-like growths on the unfeathered parts of the head and occasionally the legs. In severe cases they may occur all over the body.

These warts appear first as small blisters, which develop into doughy swellings which in turn become pustules. These break and form yellow crusts which may run together, forming masses which later become brown or black and fall off in about a week.

In cases where the virus invades the lining membrane of the mouth, tongue, and other parts, inflammation is set up with subsequent death of the tissue. Other bacteria enter and as a result large masses of yellowish material called "canker" are produced. These may be so large that the bird is unable to close its mouth; its breathing becomes difficult, the bird is unable to eat and loses condition rapidly. If the canker is removed it leaves a raw bleeding surface on which further deposits are formed.

The canker form of the disease occurs mainly in birds suffering from nutritional deficiency.

The third form which the disease may take is a catarrhal condition involving the eyes and nostrils, causing a watery discharge, which later dries out, becoming thickened and sticky, gumming the eyelids and plugging the nostrils. With blocking of the passages, the head may appear swollen, due to distension of the sinus below the eyes.

Warts appear on some birds in all outbreaks and are a reliable means of diagnosis.

Birds Affected.

Fowls and turkeys are particularly susceptible. Pheasants, water fowl, geese, parrots, pea fowls, and guinea fowls also are susceptible, but outbreaks among them are rare. Pigeons are highly susceptible to a separate strain of virus—pigeon pox virus—but are not ordinarily susceptible to fowl pox.

Outbreaks occur from October to March, and in those areas where the disease is enzootic, i.e., where it occurs every year, young birds from

six weeks old are affected. Mature birds, if they have not developed a natural immunity, also are susceptible. Autumn-hatched chickens may be affected at 2-3 weeks old, a large wart usually appearing at the base of the comb or on the face.

Means of Spread.

Contagion spreads most commonly through injured skin and mucous membranes. Birds are continually pecking and fighting, and in this way wounding the skin of the face and head. The virus is carried over from year to year in particles of dried-out scabs which have lodged in various parts of the pen, and these are conveyed to the abraded skin by the beak or with dust particles, setting up lesions at the site of entry. Infection may also enter abrasions in the lining membranes of the mouth and pharynx caused by rough particles of food.

Insects also help largely in the dissemination of the disease. Mosquitoes are well-known carriers, and the fowl tick, lice, flies, and red mites may also transmit the disease.

Effects of the Disease.

If the birds are otherwise in good health, mortality is usually low. Where, however, they are suffering from the effects of parasites, nutritional deficiency, or any other disorder losses may be very high. When young stock are severely affected their growth is retarded and heavy culling is necessary. Heavy losses may occur with autumn-hatched chickens which suffer a generalized infection. If pullets are affected before laying commences they go into moult and production is retarded. Production drops when laying birds are affected, and a considerable period may elapse before they return to production.

Treatment.

Once the disease develops, treatment is of little value except as a means of reducing the spread of the warts and repelling the attacks of insect spreaders. Greasy preparations, such as 10 per cent. carbolic acid in vaseline and lard, are most suitable and should be applied as often as time permits. Canker lesions usually respond to dressing with iodine after removing as much of the mass as possible, and good results may be obtained with the catarrhal form if the head is immersed in 2 per cent. lysol dilution daily. It is usually unwise to persevere with complicated and bad cases and they are better destroyed. The flock should be carefully watched and the food consumption kept up by mixing small wet mashers to which tonics and stimulants have been added.

Prevention.

The disease can be effectively prevented by vaccinating with "fowl pox vaccine." The operation consists of the introduction of a small amount of weakened virus into the skin. The vaccinated bird is thus affected with a very mild attack of the disease, which, in ordinary circumstances, it is able to survive and against which it builds up a resistance sufficient to enable it to withstand a severe natural attack.

Fowl pox vaccine is usually put up in packages containing a small quantity of powder and a quantity of liquid to mix with it. The two should be thoroughly mixed, and where large numbers of birds are to be vaccinated it is better to prepare enough for 50-100 birds, and when this is done to wash and dry the apparatus before preparing more. By

regular cleaning of apparatus possible spread of such diseases as leucosis is minimised. Small amounts of vaccine left over should be destroyed.

Methods of Vaccination.

There are two methods of vaccination—

(a) The intra-follicular method in which the vaccine is applied with a brush or swab to a number of feather follicles, preferably of the leg. An attendant takes the bird by the base of the wings and extends the left leg towards the operator. A few large feathers are plucked out and the brush or swab previously moistened in the prepared vaccine rubbed into the follicles. Just sufficient to moisten the follicles is all that is necessary. This method seems to give best results with the vaccine in use in Queensland.

(b) The Stab or Stick Method.—With this method a needle with two points about one-twenty-fifth of an inch is used. A piece of waxed cotton wool is twisted around the points, ensuring even depth of penetration. Care should be taken that the needle does not penetrate into the deeper tissues, for if this happens a severe systematic reaction may be set up. The bird is held in the same way as for the intra-follicular method. The feathers are moved away and the skin is pricked with the needle, which has been previously immersed in the vaccine. This method has the advantage that the dosage is even, the tissues are penetrated to the same depth and consequently the result is more uniform. It is more successful with the more concentrated and fully virulent vaccines requiring a small uniform dosage.

If birds are to be vaccinated during the day, they should be confined to pens or crates on the previous night. The operation, however, can be easily done at night and the birds are not disturbed nearly as much as when vaccinated during the day.

Precautions in Vaccination.

It must be emphasized that only healthy birds should be vaccinated. As already stated, the principle of vaccination is based on the fact that a mild attack of the disease is set up. When other diseases are present, the natural resistance of the birds may be lowered to such an extent that they are unable to withstand even this mild reaction and losses or checks in growth occur. Only those birds which are healthy and well nourished, therefore, should be subjected to vaccination.

Vaccination should never be done when—

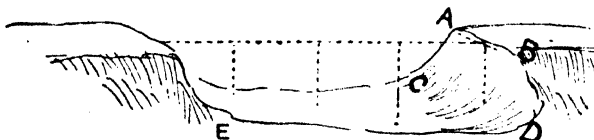
- (1) *The presence of any other disease is known (e.g. avitaminosis, coccidiosis, &c.);*
- (2) *Symptoms of internal or external parasitism are in evidence;*
- (3) *The birds lack vitality or development from earlier attacks of disease (e.g., pullorum or coccidiosis);*
- (4) *Overcrowding or dirty conditions are present.*

The most suitable age for vaccination is from 6 to 12 weeks. It may be done quite successfully earlier or later, but it has been found to have the least disturbing effect during this period. Moreover, when the birds have reached this age the feathers are well developed and when plucked leave large follicles, which enable efficient vaccination. Younger birds appear to be more susceptible to the systematic reaction, while older birds may be thrown into a false or partial moult, with subsequent retarding of production.

GADGETS AND WRINKLES

WASHAWAYS.

To estimate quantity of earth required to repair washaway of dam.



Rule.—Take mean width of washaway.

Top, A to B, say 20 feet.
Bottom, C to D, say, 40

$$\frac{60}{2} = 30 \text{ mean width.}$$

Take mean depth of washaway by averaging height of the four perpendicular dotted lines, say 20 feet $\times 26 \times 30 \times 24 = 100 \div 4 = 25$ feet mean depth.

Take length of washaway E to D, say 80 feet.

Width \times depth \times length.

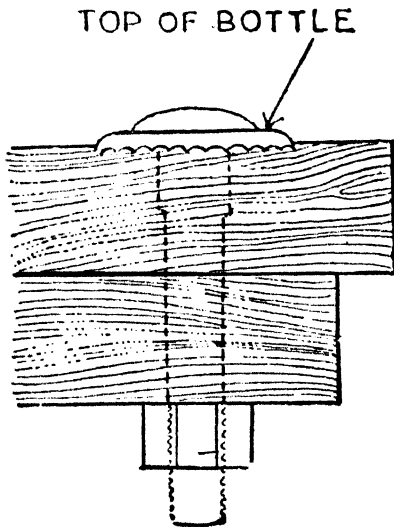
$$= 30 \times 25 \times 80 = 60,000 \text{ cubic feet.}$$

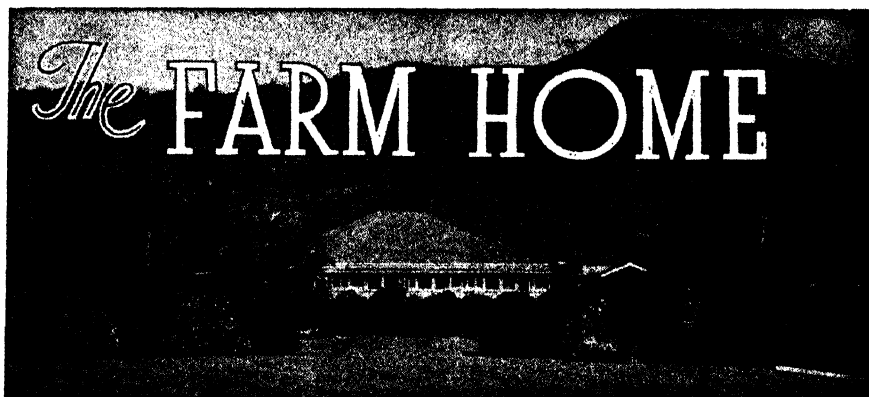
$$\frac{\text{cub. yds. cub. ft.}}{60,000 \div 27 = 2222 : 6.}$$



KEEPING BOLTS FIRM.

Nuts have a habit of coming loose, and sometimes even falling off. When they do the bolt often follows. A good way to prevent bolts from working loose and revolving is to drive down on top of them small "crinkled" bottle tops as illustrated. To prevent nuts from loosening, give a good dab of varnish. Another plan is to burr the thread near to nut with a cold chisel.





Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

HOW ABOUT A FAMILY HEALTH SQUAD!

THERE are many parents who will say "Oh, baby has to have measles or whooping cough or whatever illness is about and so he might as well get it over." This is a dangerous belief and one which may be the cause of loss of life, or, what is almost as bad, a permanent loss of health.

It is true that many of the common infectious diseases are over in a few weeks and it is equally true that one attack often confers immunity as far as the disease itself is concerned, but every illness leaves some trace—whether it be a temporary check to the child's progress, faulty enamelling of the developing teeth or permanent injury to important organs, such as the heart or kidneys.

It is the duty of all parents, fathers as well as mothers, to be aware of the causes and method of spread of infectious diseases and to take every care to protect their children from attacks of these diseases. In fact, every parent should be their family's health officer and in war time when for various reasons the health machinery of the State is over-taxed, this is more than ever important.

The two common causes of disease among babies and young children and which cause many deaths, or, at least, serious ill-health are (1) respiratory infections in which the disease germs exist in the secretions of the mouth, nose, throat and air passages and are conveyed from person to person by coughing, sneezing and in the case of very small children, smearing; and (2) bowel infections in which the disease germs exist in closet pans, garbage of all kinds and manure heaps, and are conveyed to the food by flies or handling.

Swat That Fly!

As a warning has been given that flies will be very troublesome this summer and as the summer is almost upon us, we will consider this month what the "family health officer" must do to prevent infection from this source.

In the first place, all breeding places of the common house fly must be eliminated. If the home is sewered or a septic tank has been installed, there need not be any worry on that score, provided the children are taught clean habits; but if the pan system of disposal of excrement is in use, it is necessary to see that the closet is built so that no excrement can be scattered and flies cannot get into the pan. The regulations of the Department of Health require this and show how an inexpensive sanitary closet can be built in the country.

It is also possible to keep down the number of house flies by preventing them from breeding in manure, garbage, or other decomposing matter. Manure cannot be a breeding medium for houseflies if it spread thinly on a garden or field where it dries quickly. Parents could organise their children into a "health squad" to see that the yard is kept clean and the lid kept tightly on the rubbish tin and so on. If it is explained to them why this is being done, they will be so much more interested. It takes about ten days for a fly's eggs to hatch, so even a once-weekly clean-up will help.

Cleanliness in the House.

It is most important that food, particularly milk, is clean and does not touch any unclean dish or human hand. A person who is handling food—and very especially food for babies—should thoroughly wash the hands first. Keep all milk clean, cool and well covered. Make covers from two thicknesses of old curtain or mosquito net and put over the bread, meat, and other food on the table. Butter, jam and cheese should be kept in covered dishes. Keep a fly swatter handy and be ruthless in destroying the pest which walks on all kinds of filth and then on to food.

Where there is a baby in the house a covered bucket should be provided for his napkins, and the mother should wash her hands immediately she "changes" the baby. Parents should teach their children habits of cleanliness. So, in spite of the war, the protection of children's health should not be left to others. Hence, it would be wise to organise the family health squad without delay.

In the meantime, questions on this or any other subject concerning maternal and child welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's Terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Some Unusual Recipes.

In present circumstances, recommendations are subject, of course, to the availability of the ingredients mentioned or of suitable substitutes.

Bean Fritters.

Put $\frac{1}{2}$ cup self-raising flour into a basin, break in 1 egg and beat in, adding about $\frac{1}{2}$ cup milk until a smooth batter is obtained; add about a tablespoon grated cheese, pinch salt, and $\frac{1}{2}$ cup cooked French beans. Fry in boiling fat.

Meat Savoury.

Mince the left-over beef or mutton together with an onion and mix it with a little gravy, meat extract, or vegetable water. Place half of the mixture in a piedish, cover it with sliced tomatoes, seasoned to taste, then add the rest of the meat and another layer of tomatoes. Dot with butter and sprinkle with breadcrumbs. Bake in a medium oven till brown.

Liver Breakfast Dish.

Boil gently $\frac{1}{2}$ lb. liver till cooked (about $\frac{1}{2}$ hour), drain and chop finely and put into bowl with 2 oz. chopped (cooked) bacon, add pepper, salt, and pinch of mixed herbs, and add a little milk. Mix well, put into saucepan and stir over gentle heat till very hot, but do not let it boil. Serve on hot dish.

Non-Ration Pie.

Take 4 fried sausages, skin, and shred in a piedish, cut 2 large onions fine, put on top of sausages, add a little salt and pepper, then cover with tomato sauce. Now cover with a crust of mashed potatoes, smooth on top, mark with a fork. Put 3 or 4 little bits of gravy dripping on top. Bake a nice, golden-brown. Serve with green vegetables.

ASTRONOMICAL DATA FOR QUEENSLAND.

NOVEMBER.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			CORRECTION IN MINUTES FOR OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Se
1	a.m.	p.m.	Cairns ..	+ 45	+ 12	Longreach ..	+ 42	+
6	4.59	6.5	Charleville ..	+ 29	+ 25	Quilpie ..	+ 33	+
11	4.55	6.9	Clonecurry ..	+ 61	+ 38	Rockhampton ..	+ 17	+
16	4.52	6.12	Cunnamulla ..	+ 28	+ 30	Roma ..	+ 19	+
21	4.50	6.16	Dirranbandi ..	+ 17	+ 21	Townsville ..	+ 38	+
26	4.48	6.20	Emerald ..	+ 26	+ 13	Winton ..	+ 49	+
30	4.47	6.24	Hughenden ..	+ 46	+ 24	Warwick ..	+ 3	+
	4.46	6.27						

TIMES OF MOONRISE AND MOONSET.

At Brisbane.			CORRECTION IN MINUTES FOR SOUTHERN DISTRICTS.							
			Charleville + 27; Cunnamulla + 29; Dirranbandi + 19; Quilpie + 35; Roma + 17; Warwick + 4.							
			CORRECTIONS IN MINUTES FOR CENTRAL DISTRICT.							
Date.	Rise.	Set.	Emerald.		Longreach.		Rockhampton.		Winton.	
			Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	p.m.	a.m.								
2	6.50	5.27								
3	7.56	6.12								
4	8.59	7.00								
5	9.59	7.51								
6	10.54	8.44								
7	11.43	9.39								
8	..	10.34								
9	a.m.	p.m.								
10	12.27	11.29								
11	1.07	12.22								
12	1.43	1.14								
13	2.16	2.06								
14	2.48	2.57								
15	3.20	3.49								
16	3.52	4.22								
17	4.25	5.35								
18	5.01	6.31								
19	5.41	7.27								
20	6.25	8.24								
21	7.14	9.21								
22	8.07	10.15								
23	9.05	11.06								
24	10.07	11.54								
25	11.09	..								
26	p.m.	a.m.								
27	12.12	12.38								
28	1.16	1.18								
29	2.20	1.59								
30	3.24	2.38								
31	4.29	3.19								
32	5.34	4.01								
33	6.39	4.47								
Date.	Rise.	Set.	CORRECTIONS IN MINUTES FOR NORTHERN DISTRICTS.							
			Cairns.		Clonecurry.		Hughenden.		Townsville.	
			Rise. *	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 16	+ 39	+ 41	+ 56	+ 27	+ 41	+ 14	+ 33		
3	+ 11	+ 46	+ 38	+ 62	+ 23	+ 47	+ 10	+ 39		
5	+ 9	+ 49	+ 37	+ 64	+ 22	+ 48	+ 8	+ 41		
7	+ 12	+ 47	+ 38	+ 62	+ 23	+ 47	+ 10	+ 40		
9	+ 15	+ 41	+ 40	+ 58	+ 26	+ 43	+ 13	+ 35		
11	+ 22	+ 34	+ 45	+ 54	+ 31	+ 38	+ 19	+ 29		
13	+ 29	+ 26	+ 50	+ 48	+ 35	+ 33	+ 25	+ 22		
15	+ 38	+ 18	+ 56	+ 43	+ 42	+ 28	+ 33	+ 16		
17	+ 45	+ 11	+ 61	+ 38	+ 45	+ 23	+ 37	+ 11		
19	+ 50	+ 8	+ 64	+ 36	+ 48	+ 22	+ 41	+ 8		
21	+ 49	+ 10	+ 64	+ 38	+ 48	+ 23	+ 40	+ 10		
23	+ 43	+ 17	+ 60	+ 42	+ 44	+ 27	+ 36	+ 16		
25	+ 34	+ 21	+ 53	+ 45	+ 39	+ 30	+ 30	+ 19		
27	+ 24	+ 32	+ 47	+ 52	+ 32	+ 37	+ 21	+ 27		
30	+ 12	+ 44	+ 38	+ 60	+ 24	+ 45	+ 11	+ 37		

NOTE.—The plus sign (+) means later than Brisbane time.

PHASES OF THE MOON.

Last Quarter, 8th November, 4.28 a.m.; New Moon, 16th November, 8.29 a.m.; First Quarter, 23rd November, 5.53 p.m.; Full Moon, 30th November, 10.52 a.m.

DISCUSSION.

On 21st November, the Sun rises 20 degrees south of true east and sets 20 degrees south of true west. On 26th November, the Moon rises true east.

Venus.—Throughout the month, this planet will still be visible in the western sky during the early evening. At the beginning of November, in the constellation of Ophiuchus, it sets in Queensland generally, about 9 o'clock, approximately 25 degrees south of true west. About the middle of the month, it passes into the constellation of Sagittarius and reaches its maximum declination south, setting about 27 degrees south of true west. The angle south of true west at setting will then begin to decrease until February next year, when Venus will have a declination of 0 degrees and will rise and set true east and true west respectively. By the end of November this planet, sets about 25 degrees south of west, about 9.30 p.m.

Mars.—Mars is still too close in line with the Sun to be observed. On 14th November it will be exactly in line with the Sun and earth, but on the opposite side of the sun to the earth.

Jupiter.—At the beginning of the month in the constellation of Leo, Jupiter will be a brilliant object in the eastern sky during early morning, rising near 3 a.m., 5 degrees north of true east. By the end of the month, this planet passes into the constellation of Virgo, and in Queensland rises between 1 a.m. and 1.30 a.m.

Saturn.—In Queensland, in the early part of the month, Saturn rises between 10.30 and 11 p.m. in the constellation of Gemini, about 23 degrees north of true east. By the end of the month it rises between 8.30 p.m. and 9 p.m., still 23 degrees north of true east.

True and Magnetic Directions.—Last month, the true direction at rising and setting of the Sun, Moon, planets and stars was discussed. Now will be considered the difference between true direction and magnetic, or compass direction, this difference being known as magnetic declination. If we are told a star rises true east, it will be found that at Brisbane (providing there is no local magnetic attraction) the compass direction of that star's rising will be 81 degrees or 9 degrees north of magnetic east (90 degrees). Again from Brisbane an object which has a bearing of 9 degrees east of true north, by the compass reads 0 degrees, or magnetic north exactly. If a cross be made to represent true north, south, east and west, and on the centre of this cross another cross to represent magnetic N., S., E., and W., is drawn or pivoted so that its north points 9 degrees to the east of true north, then the relation between magnetic and true direction of the cardinal points is easily seen. Now instead of the terms north, south, east and west, use degrees, i.e. 0 degrees (N), 90 degrees (E), 180 degrees (S) and 270 degrees (W). There is then a 90 degrees true and a 90 degrees magnetic, and a 0 and 180 degrees true and a 0 and 180 degrees magnetic. It will be observed that the arm representing 90 degrees true corresponds to the direction 81 degrees (90-9) on the magnetic scale, and that 180 degrees true corresponds to 171 degrees magnetic. Where the magnetic declination is east then, magnetic bearing is found from true bearing by subtracting the magnetic declination. Where the magnetic declination is west, however, magnetic bearing is found from true bearing by adding the magnetic declination. Throughout Queensland, the magnetic declination is always east, its value, however, changes as follows:—Brisbane 9 degrees east; Cairns 6 degrees east; Charleville 7 degrees east; Cloncurry 5½ degrees east; Cunnamulla 7½ degrees east; Emerald 7½ degrees east; Hughenden 6 degrees east; Longreach 6½ degrees east; Quilpie 7 degrees east; Rockhampton 8 degrees east; Roma 8 degrees east; Townsville 6½ degrees east; Winton 6 degrees east. Lines on a chart which join places of equal magnetic declination are known as Isogonic lines. In Queensland these lines run in a general north east-south west direction.

Supplied by the Astronomical Society of Queensland.

QUEENSLAND WEATHER IN OCTOBER.

Rainfall totals were well under average throughout the State except at very isolated stations. Rain in the south-east districts, accompanied by local thunder, occurred in the early part of the month. The relief effects of August rains are now diminishing; although some districts were in fair condition general falls throughout all agricultural and dairying areas in the State were needed. With an estimated crop of 6,000,000 bushels almost ready for harvesting the continuous dry weather was an advantage to grain growers. Most inland pastoral areas had carried through on the general rains of last February, but early storms to replenish pastures and surface water supplies were needed.

Temperatures.—Average maximum temperatures ranged from approximately 1 to 3 degrees below normal except at Thargomindah, plus 1 degree, and Stanthorpe plus 2 degrees. Minimum figures also were from 1 to approximately 6 degrees below normal, except in the South-West, Thargomindah plus 4 degrees. Daily maximum readings over 100 degrees were recorded in the West 12-15th (102 degrees, Thargomindah on 14th and 15th).

Some frosts occurred on the Downs Highlands.

The rain position is summarised below—

Division.					Normal Mean.	Mean October 1944.	Departure from Normal.
					Points.	Points.	Per cent.
Peninsula North	..	..	..	..	45	19	58 below
Peninsula South	..	..	..	..	70	3	96 "
Lower Carpentaria	..	..	..	..	52	11	79 "
Upper Carpentaria	..	..	..	..	76	13	83 "
North Coast, Barron	..	..	..	..	133	89	33 "
North Coast, Herbert	..	..	..	..	178	134	25 "
Central Coast, East	..	..	..	..	129	29	78 "
Central Coast, West	..	..	..	..	77	71	8 "
Central Highlands	..	..	..	..	146	32	78 "
Central Lowlands	..	..	..	..	98	19	81 "
Upper Western	..	..	..	..	60	12	80 "
Lower Western	..	..	..	..	71	26	63 "
South Coast, Port Curtis	..	..	..	..	208	80	62 "
South Coast, Moreton	..	..	..	..	274	133	51 "
Darling Downs East	..	..	..	..	223	87	61 "
Darling Downs West	..	..	..	..	165	64	61 "
Maranoa	..	..	..	..	161	63	61 "
Warrego	..	..	..	..	110	20	81 "
Far South-West	..	..	..	..	86	Nil	100 "

RAINFALL IN THE AGRICULTURAL DISTRICTS.

SEPTEMBER RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Sept.	No. of years' records.	Sept., 1944.	Sept., 1943.		Sept.	No. of years' records.	Sept., 1944.	Sept., 1943.
<i>North Coast.</i>	In.		In.	In.	<i>South Coast—contd.</i>	In.		In.	In.
Atherton	0.74	42	2.30	1.83	Gatton College	1.43	44	1.86	2.04
Cairns	1.65	61	4.48	1.65	Gayndah	1.47	72	0.56	2.21
Cardwell	1.47	71	1.18	1.73	Gympie	2.02	73	1.77	5.08
Cooktown	0.56	67	1.90	1.37	Kilkivan	1.61	62	1.11	3.39
Herberton	0.55	57	1.20	0.93	Maryborough	1.84	72	1.26	2.02
Ingham	1.51	51	2.56	3.61	Nambour	2.26	47	3.00	6.34
Innisfail	3.52	62	5.88	4.03	Nanango	1.71	61	0.74	2.65
Mossman	1.93	19	3.42	3.82	Rockhampton	1.22	72	0.74	2.11
Townsville	0.50	72	0.05	1.75	Woodford	2.04	55	1.45	2.93
<i>Central Coast.</i>					<i>Central Highlands.</i>				
Ayr	1.21	56	..	1.28	Clermont	0.95	72	0.07	3.00
Bowen	0.77	72	0.09	0.50	Springsure	1.22	74	0.60	2.22
Charters Towers	0.75	61	..	2.91	<i>Darling Downs.</i>				
Mackay	1.60	72	0.75	4.23	Dalby	1.61	73	1.70	1.96
Proserpine	1.89	40	2.30	1.46	Emu Vale	1.66	47	1.48	3.23
St. Lawrence	1.19	72	1.08	2.82	Jimbour	1.52	64	1.47	1.56
<i>South Coast.</i>					Miles	1.26	58	1.62	3.17
Biggenden	1.38	44	1.00	1.56	Stanthorpe	2.19	70	1.12	4.08
Bundaberg	1.48	60	0.81	2.42	Toowoomba	2.01	71	1.75	2.86
Brisbane	1.93	91	1.49	3.94	Warwick	1.75	78	1.30	2.37
Caboolture	1.76	67	1.91	4.39	<i>Maranoa.</i>				
Childers	1.64	48	1.58	2.20	St. George	1.03	62	0.76	1.12
Crohamhurst	2.49	50	..	5.65	Roma	1.32	69	1.80	5.26
Eak	1.94	56	1.29	2.08					

CLIMATOLOGICAL TABLE FOR SEPTEMBER.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	SHADE TEMPERATURE.		EXTREMES OF SHADE TEMPERATURE.				RAINFALL.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
<i>Coastal.</i>	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns .. ..	..	80	64	85	5	57	2, 3	448	16
Herberton .. ..	..	72	53	84	4, 16	44	4	120	11
Townsville .. ..	..	80	62	85	2	54	18	5	2
Brisbane	30.22	72	55	81	15	48	12	149	11
<i>Darling Downs.</i>									
Dalby .. ..	..	74	47	86	1	33	12	170	3
Stanthorpe .. ..	..	67	40	74	22	27	12	112	4
Toowoomba .. ..	..	67	49	80	1	38	18	175	6
<i>Mid-Interior.</i>									
Georgetown	30.01	89	61	99	25	52	1	..	..
Longreach	30.16	87	58	99	30	41	17	8	2
Mitchell	30.22	75	45	86	14	33	18	66	3
<i>Western.</i>									
Burketown .. ..	..	87	64	91	3, 4, 10	57	6, 17	..	..
Boulia	30.04	88	59	97	13, 14	43	17, 18	49	1
Thargomindah	30.16	80	55	91	13	44	17, 18	..	..

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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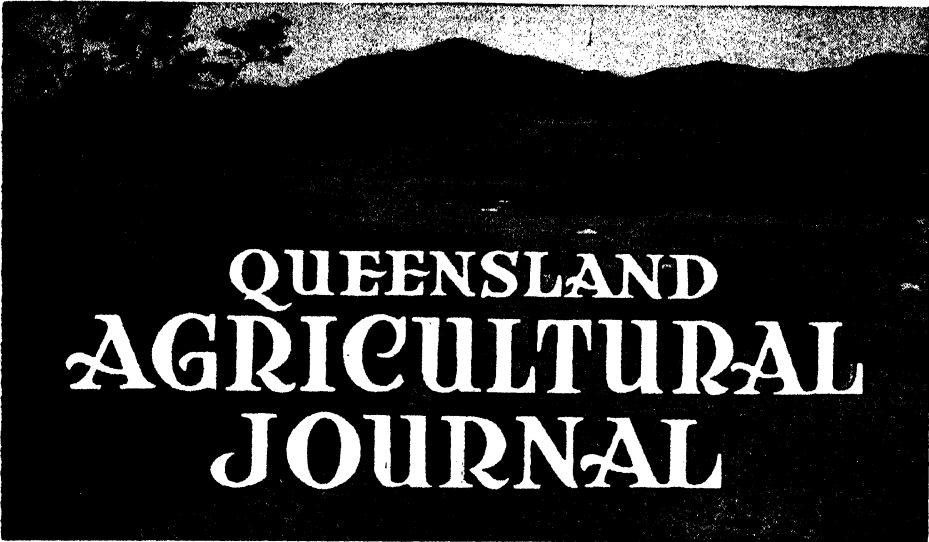
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QUEENSLAND AGRICULTURAL JOURNAL

Volume 59

1 DECEMBER, 1944

Part 6

Event and Comment.

Feeding Cows for Profit.

BBETTER and regular feeding of milking cows not only increases dairy production, but adds substantially to farm income. Both increased output and profit depend on right feeding, and if feed has to be bought then its cost should be on a basis of sound economy. Grass, green fodder, and home-grown silage are the cheapest of cattle foods. If feeds in concentrated forms also are available, so much the better, but at present many of them are either in short supply or unobtainable. The food requirements of dairy cows may be ensured, however, by improved pastures and the growing of lucerne, clover, oats and millet for grazing, cow peas, field peas and vetches.

Under-feeding increases the cost of every gallon of milk and so reduces the profit. All hand-feeding should be by weight and not by guess. Seasonal conditions and circumstances permitting, the dairy farming programme should be so arranged that the supply of milk-making fodder is continuous and sufficient. Three important restrictive factors in dairy production are poor cattle, insufficient feed, and lack of balance in the feed.

Another important point in dairy practice is that high production cannot be obtained from dairy cows which are allowed to calve while in poor condition. Feed invested in building up a dairy herd, and especially in the building up of cows before they calve, is never a loss; it is an investment that usually pays for itself many times over.

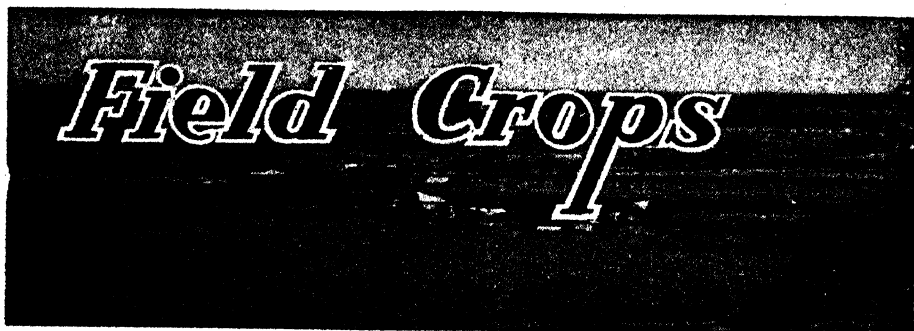
Healthy Herds and High Production.

WHEN cows are sick or suffering from any disability, it is not fair to expect them to give the same amount of milk they yield when they are well. As every dairy farmer knows, cow-keeping is a study on its own, and to get the most out of a dairy herd it is necessary to acquire as much practical knowledge as possible and apply that knowledge in the running of a dairy farm. The study of the business starts when the calf is born. To give the calf a good start in life, it should be properly fed to ensure its satisfactory growth and general development. A stunted animal is not a normal animal, and no farmer wants anything but a normal animal in the replacement section of his dairy herd. After doing all that can be done in the way of providing the right feeds, and also providing for proper feeding, it is necessary to be watchful for any indication of worms in the calf, or the oncoming of any ailment to which calves are susceptible, and which may prevent its growth into a profit producing cow.

Probably stomach worms, lung worms, blood scours, calf pneumonia, and blackleg are the most common causes of setbacks in the life of a calf, so obviously, in the event of the occurrence of any of these troubles, it is wise to be prepared for suitable treatment—having always the right remedies on hand. As in everything else, however, prevention is always better than cure. Most dairy farmers have a fund of practical knowledge of the ways and means of either preventing or treating ordinary stock ailments; in any case, the district dairy instructor is willing to help with advice and skilful treatment, if veterinary assistance is unavailable.

Health in the dairy herd and quality production go together. Every dairy herd should be tested for T.B. and contagious abortion, and all positive reactors destroyed to avoid the risk of these diseases spreading throughout the herd, and to neighbouring dairy herds. Mammitis is another curse in a dairy herd, and everything should be done to prevent, or limit, its occurrence. This disease costs the Queensland dairy industry an immense amount of money every year, and no available means of eradicating it when it does occur should be neglected. On every dairy farm there should be an isolation or "hospital" paddock for sick stock. Suitable medicine chests, and instruments and other necessary equipment, should be kept in a handy and safe place in every dairy.

Milk may be fittingly described as one of the country's greatest liquid assets. It is plain, therefore, that as a healthy herd means high production, everything should be done that can reasonably be done to keep dairy herds healthy. Healthy herds, quality production, and more production are a national need—a need greater now than at any other period in Australian history.



Grain Sorghums.

C. J. McKEON.

ALTHOUGH grain sorghums have been grown in Queensland for many years past, it is only during recent years that this crop has become an important one in Australia's rural economy; that is, from the point of view of producing the grain to be marketed in the same way as is maize and wheat for stock feeding purposes.

For very many years maize and wheat have been our chief grain crops and while it is not suggested, nor is it desirable, that grain sorghums shall displace either of these very valuable grain crops, the ability of grain sorghums to produce good crops of grain under climatic conditions which would be fatal to many other crops justifies the belief that they will become one of the chief grain crops in some districts. By some districts, is meant those districts in which maize growing for grain is risky because of unreliable rainfall.

Introduction of Dwarf Varieties.

The remarkable development of grain sorghum growing during the last few years followed the introduction of dwarf types which can be mechanically harvested. Prior to the introduction of these short growing types, only the tall varieties were in cultivation. The height of these varieties made it necessary to harvest them by hand; harvesting costs were therefore heavy, so their production was limited to small, or comparatively small, areas for use on the farm on which they were grown. Now the position is different, as very large areas can be produced on individual farms, this being possible by the fact that they are harvested with a header, the same as is wheat.

The introduction of the dwarf types was made by the Queensland Department of Agriculture in 1932 and 1933 from Departments of Agriculture in the United States of America, South Africa, and Egypt. Many varieties were introduced and, after trials continuing over several seasons, the varieties Kalo, Wheatland Milo and Hegari, each of which can be mechanically harvested, proved highly suitable and are now the most extensively grown.

Although considerable work has been done by Australian plant breeders in making selections to suit local conditions since their introduction, full credit should be given to the plant breeders in the

countries in which these varieties were evolved. Remarkably high yields of grain are obtained from these varieties. Last season, yields up to 120 bushels per acre were harvested from some crops, and while admittedly this may be an unusually high yield, yields in the vicinity of 90 bushels an acre are frequently obtained.

Crop Expansion in Queensland.

The following figures indicate how rapidly the grain sorghum growing is expanding in Queensland:—For the season 1941-42, the area sown was 25,340 acres and the yield 353,000 bushels. For 1942-43, the area sown was 40,618 acres and the yield 730,000 bushels. For 1943-44, the area sown was 54,690 acres and the yield 1,400,000 bushels. In addition to those acreages considerable areas were sown and fed to stock on the farm, either by grazing the crop off with sheep or cattle, or by harvesting the grain and retaining it for use on the farm.

It is confidently anticipated that production during the coming season will show a substantial increase over that for the previous season. The crop objective set is 3,000,000 bushels for Queensland, and there is every reason for optimism as to the prospects of this objective being attained, providing, of course, weather conditions are favourable.

Grain Sorghums Increase Food Production.

Realising the importance of the grain sorghums on the maintenance of essential food production, the Commonwealth Government is prepared to enter into contracts with growers at the attractive price of 3s. 7d. per bushel of 60 lb.

No single industry has benefited to a greater extent from increased grain sorghum cropping than the poultry industry. During the past year, sorghums not only made it possible to greatly increase egg production, but at times prevented a collapse of the industry when other grain was unavailable for manufacturing feeding mash. One organisation alone—one of the largest distributors of poultry foodstuffs in Australia—used approximately half a million bushels of grain sorghums. This quantity would be sufficient to provide for, approximately, 300,000 fowls for a whole year.

In Queensland, for September of this year, egg production was 25 per cent. greater than for the previous month, and was 30 per cent. greater than for September of last year. Had it not been for the 1½ million bushels of grain sorghum which were available at a critical period, these results could not have been achieved.

For the coming year, the egg production objective for Queensland has been set at 8½ million dozen within a region of which Bundaberg is the northern limit, and it is hoped that seasonal conditions will be favourable so that the maximum production of grain sorghums will be possible to ensure the attainment of this target.

It would not be possible to estimate the extent to which grain sorghums have affected the production of lamb and mutton, but it would be very considerable. Large areas are sown specifically for that purpose and the number of sheep which can be grazed for a considerable period on each acre of mature sorghum has to be seen to be appreciated. Even crops, from which the grain has been harvested, are of considerable

value for grazing sheep. Apart from the grain which has been missed during harvesting, the stalks are still green when harvesting is finished and make very useful grazing.

The value of grain sorghums for raising and fattening bacon pigs is now fully appreciated, especially in the districts in which the sorghums are produced.

As other States of the Commonwealth, besides Queensland, are closely interested in the further development of this excellent crop it is believed that grain sorghums will soon be established as a definite and increasingly valuable contribution to the agricultural economy of the Commonwealth.

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Plate 94.

AFTER THE STORM.—Near Macalister, Northern Darling Downs, Queensland.



Growing Cotton with Supplementary Irrigation.

W. A. R. COWDRY, Acting Manager, and N. H. ADAMS, Field Assistant,
Biloela Research Station.

THE Queensland cotton crop is mostly produced in districts receiving an average annual rainfall ranging from 26 to 35 inches, with much of the acreage in the 28 to 30 inch rainfall belt in the south-eastern part of the State. The results of investigations and demonstrations conducted in these districts over the last 20 years have indicated that where proper rotations and cultural operations are practised on soils suitable for cotton, good yields can usually be obtained in this area under rain grown conditions. In most seasons, however, the investigations have indicated that additional moisture at critical periods in the development of the cotton crop would have materially improved the yields.

The Queensland Government therefore decided in 1940 that the merits of growing cotton with supplementary irrigation obtained from both surface and underground waters should be investigated, and, as a part of the programme, irrigation facilities were provided at the Biloela Research Station through the development of a supply of well water to irrigate 8 acres by means of tractor powered equipment. The investigations conducted at that centre in the following four years comprised varietal trials to ascertain the most suitable variety for growing with supplementary irrigation in the Callide Valley, tests of the merits of growing cotton with and without supplementary irrigation, tests of the merits of furrow and spray irrigation, and studies for the determination of the best periods to apply irrigation. While much investigational work remains to be done, sufficient progress has been achieved in the investigations to warrant the presentation of a brief summary of the results to date.

Varietal Trials.

The varietal trials have embraced various strains of Miller—the main variety grown in the Callide Valley without supplementary irrigation—New Mexico Acala, Indio Acala, Farm Relief, Stoneville 5, and Rowden 40-6-F. 3. The results have been in keeping with those obtained in rain-grown varietal trials, i.e., the quicker fruiting, heavy yielding, fine fibred Farm Relief and Stoneville were affected more by high temperatures and had more exacting water requirements than the

slower fruiting coarser fibred types like Miller and New Mexico Acala. Consequently the finer fibred varieties showed wider fluctuations in boll size, yields and quality of fibre than the coarser fibred types.

Although not always the leading producers, the yields in pounds of seed cotton per acre obtained from Miller and New Mexico Acala respectively:—1940-41, 1,792-1,845; 1941-42, 2,028-1,928; 1942-43, 1,099-1,202; and 1943-44, 1,851-1,822—in conjunction with the size of boll and the quality of fibre produced, make either of these varieties suitable for growing with supplementary irrigation on the heavy loams and clay loams of the Callide Valley. These varieties would not be as suitable, however, as the quicker flowering Triumph, Farm Relief and Stoneville, for the more fertile alluvial sandy and heavy loams of the general Burnett and West Moreton districts.

Irrigated Versus Non-Irrigated Cotton.

The results of the comparisons of irrigated and non-irrigated cotton have given most conclusive evidence of the value of growing cotton—on the soil type concerned—with supplementary irrigations during seasons of such irregular rainfall as have been experienced during the four years of this experiment. In all four years the availability of irrigation facilities has allowed of earlier planting, which, with more subsoil moisture and the application of water during stress periods at mid-season, gave improved yields of seed cotton, as evidenced in Table I.

TABLE I.

IRRIGATION COTTON			RAIN-GROWN COTTON	
	Time of planting	Yield per acre	Time of planting	Yield per. acre
1940-41	.. 18th Oct.	1,456 lb.	14th Nov.	420 lb.
1941-42	.. 11th Oct.	1,721 lb.	14th Oct.	564 lb.
1942-43	.. 3rd Oct.	1,137 lb.	9th Nov.	489 lb.
1943-44	.. 14th Oct.	1,741 lb.	20th Oct.	653 lb.
Mean yield lb. seed cotton per acre	.. ..	1,514		531

The soil type on which these experiments were conducted is fairly typical of the strip of medium to heavy loams generally adjacent to the creeks in the Callide Valley. The yields of the rain-grown cotton are not thoroughly indicative, however, of the possibilities of this form of cotton growing under the seasonal conditions experienced. On other parts of the Research Station, consisting of heavier loams and clay loams, appreciably better yields of rain-grown cotton were obtained during this period on cultivations in the first three seasons following grassland. Undoubtedly, however, supplementary irrigation is highly advantageous on soils suitable for this form of cotton growing.

Furrow Versus Spray Irrigation.

The results of the Biloela experiments indicate that, where the land can be graded so that the water will flow uniformly down the furrows without overflowing the ridges between them, as good yields of cotton can be obtained by applying the water in furrows as by the spray method of irrigating except in the case of very sandy soils. Where the field is either very undulating or very sandy, however, the spray method of irrigation allows of a more uniform application of water and, in the

case of sandy soils, of a better regulation of the amount of water applied than is possible with furrow irrigation. The spray method of irrigation requires more labour, however, due to the necessity to change the spray line.

Time of Application of Irrigation.

The experimental results indicate clearly the advisability of applying a preplanting irrigation in time to plant at mid-October. In a wet spring the irrigation may be timed to allow of planting in the first week of October, but in a dry spring there is always the danger of early planted cotton suffering serious terminal loss through attacks by insects which may concentrate on the young cotton—the only green growth that may be present. The reduced yields of irrigated cotton for the 1932-43 season presented in Table I. were the result of such an attack.

The preplanting irrigation should be an application of not less than 3 acre inches per acre, i.e., the amount of water required to cover an acre to a depth of 3 inches. The top six inches of the heavy loams and clay loams on which cotton is usually grown will normally contain very little moisture at the time of application of the preplanting irrigation and 3 acre inches will be required to wet an acre of such soils to a depth of 18 inches when they are in this dry state. It is advisable to have at least this depth of wet soil at planting time in order that the plants may grow steadily until January without additional moisture other than that supplied by the normal rainfall.

In January, the plants should be so heavily laden with squares and bolls that an irrigation will be necessary to provide their moisture requirements during the fortnight of hot, dry weather that usually occurs following the first week of that month. It is advisable, therefore, to apply at least a 3 acre inch irrigation early in January unless very heavy penetrating rainfall has been experienced during the last week of December. A good indicator to use in deciding if an irrigation is necessary early in January is the position of the top flowers on the plants. If the flowers are within a foot of the top of the plants at this stage of growth, it will be advisable to apply such an irrigation, otherwise plant growth will be checked quickly, with a consequent loss of crop during any following prolonged hot dry weather.

The water requirements of heavily laden cotton plants during hot, dry weather in January are so high that most of the available moisture in the top foot of soil is exhausted by the plants within a fortnight after this soil zone is wet—even to its full capacity to hold water. It is advisable, therefore, to give the plants a 3 acre inch irrigation a fortnight after the first irrigation in January, if hot dry weather has prevailed following that watering. The second irrigation in conjunction with the February rainfall, which, for most of the cotton growing districts, normally approximates 4 inches, should be sufficient to maintain satisfactory plant growth until March. If the second half of February is hot and dry, however, it will be advisable to apply a 2 to 2½ acre inch irrigation early in March to ensure continuation of plant growth and the proper development of the late middle and top crop of bolls. No further irrigation should be required, as the rainfall for March and April, in conjunction with the early March irrigation, will normally be sufficient to mature the crop.

The above indicated time-table of irrigations has been used at the Biloela Research Station in producing the yields reported in the varietal trials. The total rainfall during the growing period of the four years of trials was respectively 19, 29.5, 16.8 and 23.5 inches, or a mean of 22.2 inches, which, with the application of 11 to 11.5 inches of irrigation water would thus provide approximately 33 inches of water for the growing season. It is significant that investigations overseas have indicated that irrigated cotton requires roughly this amount of water. It is recommended that farmers growing cotton with supplementary irrigation should test the suitability of the time-table of application and the quantities of water used at the Research Station, for their soils.

Summary.

Investigations have indicated that good yields of rain-grown cotton can be obtained where proper rotations and cultural practices are followed. Evidence was obtained, however, that additional moisture during critical stages of plant development would have been beneficial in most seasons.

Irrigation facilities provided at the Biloela Research Station have allowed of investigations being conducted which have confirmed the value of supplementary irrigation over a four-year period of irregular seasonal conditions.

The results of irrigation varietal trials, methods of application of irrigation water and times of application are presented for the guidance of irrigationists following this form of cotton growing.



Plate 95.

AN EARTH TANK IN THE BRIGALOW COUNTRY, WYAGA, GOONDIWINDI.



Pineapples in North Queensland.

W. G. HANCOCK, Plants Inspector, Bowen.

THE improvement in pineapple culture developed during recent years is generally well known; in fact, it is doubtful if there is any fruit industry which has made so much progress in so short a time. Average crops per acre have been increased, the crop can be timed to mature within close limits, and the effective life of a planting has been lengthened. That bane of the farmer—"wilt"—nowadays causes little trouble. However, while the large amount of experimental work which has been done, mostly in the South, is equally applicable in principle in North Queensland, certain modifications in detail are indicated owing to different climatic conditions and growing for market rather than for the cannery.

As elaborated later, the climatic extremes of North Queensland, its torrential rains, its periods of hot dry weather, together with the high soil temperature during periods, all constitute special problems.

The Pineapple Plant.

The pineapple is a Monocotyledon, and belongs to the natural order Bromeliaceae. Many related plants are grown in bush houses. It has also in close relationship a number of plants leading a semi-aerial life on trees and rocks, such as orchids. Another of the Bromeliaceae, the "Spanish Moss" of Florida is entirely air dwelling. The pineapple bears no relationship to the cactus family, as popularly supposed.

In accord with this family relationship the pineapple's roots are intolerant of poorly-aerated soil conditions. It is a shallow-rooted plant thriving in a loose, moist medium.

It gives another indication of its ancestry in its habit of forming new roots from its ageing leaf axils. Under natural conditions these would be continually covered by accumulating layers of leaf debris. In cultivation it is often of benefit to shovel soil in amongst the butts of plants as they become older.

The leaves are specialised to make the most effective use of a sparse rainfall, and at the same time, by shading the soil, to keep it cool and moist and hinder evaporation. Even a heavy dew will provide an appreciable quantity of water to the roots.

Soil and Site.

The above brief examination of some points in the plant's status suggest that it will do best in a loose, open soil, well drained but moisture-retaining, and with a high humus content. In practice this description exactly fits those soils growing the best plants. A good crumbly sandy loam overlaying a moisture-retaining but well-drained subsoil is probably the ideal.

The plant is strongly influenced by the amount of available iron in the soil. The availability may depend on the degree of acidity of the soil. Broadly, in an acid soil the iron is available, while in the contrary case it is not.

However, it is often noticed that plants make very satisfactory growth in a newly-cleared soil. In this case the soil will be found to be rich in humus left by the recently cleared vegetation. While the humus lasts it will itself supply the plant with iron, but, after several years of exposure, the supply will be exhausted. This shows readily enough the necessity of humus.

Very heavy compact soils are not suitable, for reasons already advanced, and very sandy soils are usually deficient in nutrients and highly leached of iron and other elements; furthermore, they dry out too quickly.

In brief, the points to look for in choosing a pineapple soil are—perfect drainage, moisture, loose open texture, and a high humus content. In addition, a suitably acid reaction or one capable of being rendered so.

In choosing a site one naturally ignores any situation subject to flood, and, conversely, any site, such as a narrow ridge, which will become unduly dry during protracted dry weather. Land, either flat or with a gentle slope, is best in the tropics, where torrential rain will cause severe erosion on cultivated land with a pronounced slope. The aspect does not have such a pronounced effect as in the south.

Preparation.

Although the pineapple is a shallow-rooted plant, land should be carefully prepared. According to the nature of the soil, it should be broken up to a fair depth and worked to a good tilth. Some soils of a very sandy nature are often badly leached on the surface, while just below the usual plough depth there is a strata of similar texture but darker in colour and rather heavier. In such cases it is often advisable to turn up this heavier layer and incorporate it with the sandy top, thus enriching the latter with materials previously leached from it.

When sulphur is to be used (see later), it is evenly broadcasted over the prepared surface and lightly harrowed under. Old land will in all probability be deficient in humus, and every effort to rectify this will repay. In the drier districts this is not always a simple matter without irrigation. The summer is, of course, the normal period of growth of a green crop and is also the usual period for planting pineapples. If, however, a summer cover crop could be established early, and, as soon as this is ploughed under, a winter crop set, it should be possible to obtain a fair cover for the winter months and the land prepared for planting the following summer.

When it is intended to replant an old block of pineapples the old plants will provide a valuable source of humus if they can be cut up with a heavy rotary cultivator and allowed to rot. The late spring is a suitable time. The rotting process will be hastened and additional humus provided if a crop of cowpeas is sown amongst the rubbish and the whole lot ploughed under together. A dressing of superphosphate will augment the growth of the cowpeas, and, through that, become available to the pineapples.

Planting.

A factor of major importance in tropical agriculture is high soil temperature. This is a problem peculiar to the North Queensland latitude. Of course some plants will tolerate far higher temperatures than others, but few will thrive when the bare stem and the roots are subjected to soil temperature of between 130 degrees F. to 140 degrees F. on the surface. Optimum growth is probably made when with adequate moisture the surface is about 90 degrees F. A typical reading taken at 2 p.m. on a December day indicated that with a shade temperature of 84 degrees F. the bulb showed 90 degrees F. just buried in the shaded surface under thickly-growing pineapples; it was 132 degrees F. just buried in the unshaded soil.

This shows what widely different conditions are enforced on plants growing as individuals under cultivated conditions as distinct from those growing in their natural state. For instance, in a tropical rain forest scores of plants are revelling in warm, moist conditions produced by the mutual shading. When the forest is cleared, however, not many of them, other than a few of the dominant large trees, would flourish when planted in rows on the same ground. Even those which clamber out into the sunshine require their roots to be in a moist shaded soil. In a flower garden, also, if plants are set closely enough for the foliage to touch they will stand up to heat which would quickly wither them had they been set wider apart.

The principle is the same with pineapples. For practical considerations room must be left to work amongst them, but from the point of view of vegetative growth the closer, within reason, they are planted the better. It should also be remembered that in the tropics bare cultivated ground deteriorates very rapidly through the loss of the humus.

The standard planting in South Queensland is to plant Smoothleaves in double rows set 2 feet apart and Roughleaves in single rows. In each case the plants are 12 inches apart in the rows. The inter-row space in each case is 4 feet. The number of plants per acre in each case will be 14,520 and 10,890 respectively. In the tropics it would seem better to put the plants 12 to 14 inches apart in the rows and have the inter-row space 5 feet. The number of plants per acre, therefore, would be approximately 10,500 and 7,280 respectively.

Comment is sometimes heard that with this spacing it will not be possible, after the third crop, to get between the rows. This is answered by the fact that after three crops the fruit usually deteriorates in size and it becomes time to eradicate, renovate the soil, and replant, however it was planted, and it is poor business to deliberately set out to get two small crops when the fruit should be at its best, solely to be able to pick the third in comfort.

When laying out the rows consideration must be given to erosion and ease of working. In the tropics steep slopes are not advised. On a slight fall it is usually best to plant in short rows up and down the

slope so as to shed the water quickly into cross drains. A lot however will depend on the soil type. Short rows and sufficient tracks will assist in handling the crop. While in South Queensland a north-south alignment is best so as to allow even illumination to each side of the row, in the tropics east-west is preferable since a better shade effect is obtained in early forenoon and late afternoon.

The actual planting is fairly simple, but care should be taken to lay out and plant evenly. The obvious way is to first lay out any tracks and then peg out the land at 7 feet or 5 feet intervals. A planting wire is stretched between pegs and the plants set out at the correct intervals. A piece of iron rod beaten out flat at one end to a spear shape is a suitable planting tool. The work is much speeded up if the suckers are roughly laid out first. Excessively deep planting should be avoided.

Planting Material.

Tops from cannery fruit are often used in the South. In North Queensland, however, even if available, they would probably be unsuitable by reason of the higher soil temperatures, unless weather conditions at planting time were very favourable.

Slips, which are the growths from the fruit stalk, can be used if well developed, otherwise they may not stand up to the heat.

Suckers are the favoured planting material. They are best when of medium size. Very large suckers which are near to flowering are unsatisfactory, since they will flower and fruit before being properly established. The fruit will be too small to be of any value, and, furthermore, they seldom make strong plants: their suckers sprout from high up and usually wilt when bearing a fruit. It is obvious that a fair percentage of these will seriously reduce the yield from a plot. If through shortage of material they must be used they should be planted separately and set deep. But they are seldom satisfactory.

The best size of suckers are those which will flower about six to seven months after planting. A quicker rooting will ensue if a few of the base leaves are stripped off. If it is necessary to keep suckers for any length of time before planting, they should be spread out in shallow layers in the shade. If heaped up they will sweat and rot. Always sort into two lots, large and small, and plant separately. To have sections of the farm cropping evenly will facilitate later operations, and, furthermore, large plants tend to shade and smother small plants, to their detriment.

Sucker Selection.

If any new plantation is closely examined at the time of the first crop, a wide range of variation between the plants will usually be noticed. The most obvious difference may be that some plants have already matured fruit, while others have not flowered. If this cannot be attributed to having planted suckers of unequal development, then there is a high probability of early and late maturing strains being present.

Another variation is that some plants are sturdy and squat, and are already growing several low-set suckers in addition to the fruit. Others have no suckers, but instead have a dozen or more slips around the fruit—a "collar of slips," as it is called. Between these two types—a good type and a most undesirable type—there may be many grades.

Obviously the former plant is a profitable plant to grow, because it is a quick bearer and free-suckering, whereas the second type gives one good pine, but too often that is the first and last it will bear, since it has no suckers to bear subsequent crops.

Certain types of misshapen fruit are also hereditary, particularly "cripples" in Roughs. The sign of this is a thin, corky hairline throughout the length of the leaf.

Many variations will be found; some like the above are hereditary; others may be the result of variations in nutrition, but in general it is wise to propagate only desirable types and to reject all others. It is to labour the obvious to point out that the returns of a plantation are reduced by a proportion of unprofitable plants. The danger is that when the "collar of slips" type, for example, is present, and selection is not practised, a vicious circle sets in, since there is considerably more planting material available from this type than from the suckering type, and eventually the bad type predominates and ousts the good type.

At first growers must be content to make the main planting from good average suckers, discarding all definitely bad types. Then, if at thinning out after the first crop a selection is made from the finest plants, and these are planted separately, a pedigree stock will soon be built up.

Time of Planting.

From the purely horticultural aspect, time of planting is largely governed by suitable weather, both at the time of planting and for the few months immediately following. To plant during times of torrential rain risks having young plants washed out, buried in silt, or rotting. To plant during the months of low rainfall would result in plants being very slow in taking root, and the effects of the consequent setback may be visible during the whole life of the plantation. The most important period in the life of a plantation is the first few months after planting. The plants must be brought on quickly so that in as brief a period as possible they become large enough to shade the soil under them. This is touched upon under "Fertilizing" from a different angle. The point stressed here is that it is best to plant when the longest period of good growing weather to immediately follow can be anticipated, and if necessary to later adjust the time of cropping by the use of acetylene.

The following table gives the months of the year when on an average the rainfall exceeds evaporation, and, therefore, gives some guide as to suitable planting months for the different divisions. In planning ahead, however, reliance cannot be placed absolutely on getting the average rainfall. At Townsville, for instance, the average on seventy years is 45 inches, but actual figures range from 9 to 97 inches.

Cairns	From Dec. to April-May
Innisfail, Coast	Nov. to Sept.
Innisfail, further inland	Dec. to June
Cardwell	Dec. to May
Ingham	Dec. to April-May
Townsville	Jan. to March
Ayr	Jan. to March
Bowen	Jan. to March
Mackay	Dec. to June

A general recommendation would be to plant in the drier districts between the end of December and end of February, and in the wetter districts just after the period of heaviest rain, which would usually mean planting about April.

Cultivation.

The golden rule is to cultivate as lightly as circumstances will permit. To keep down weed growth and break the soil surface is sufficient. Deeper cultivation than this only breaks roots and results in the deeper drying of the soil. To deal with the luxuriant growth of weeds during the period of the summer rains may justify or necessitate greater disturbance of the soil, but since there is more moisture present not so much harm is done. The roots of plants maturing fruit, however, must not be broken. In particular, the time of transition between the period of the heavy summer rains and the dry months following is a critical one to plants maturing fruit, since their water requirements are high in order to continue to support the development of fruit, suckers, and growth produced during very favourable growing conditions. To damage their roots at this time gives them a severe setback. Nothing but the hoe should be used within a foot of them.

The aim should be to so utilise the means available—sucker-grading, time of planting, fertilizing, acetylene, and, if available, irrigation—that each section of the farm will be fruiting separately and in succession. This is quite attainable and makes operations much easier, since picking can be concentrated in a limited area. Fertilizer can be more efficiently applied to suit the growth status, and cultivation facilitated. For instance, in the case of plants maturing fruit one would withhold fertilizer until it was picked, and cultivation, if necessary, could be done with special care.

Fertilizing—Special Treatments.

Wartime restrictions on the use of the usual fertilizer ingredients require that modifications shall be made. However, in principle there still seems no better way to give fertilizer to established pineapples than by a water-soluble mixture placed in the leaf bases. Each plant receives a small quantity which gradually dissolves and becomes immediately available. By this method the fertilizer is not spread amongst the plants, as this has been proved to be less effective and to entail considerable waste. The rate of application is calculated at so much per thousand plants and not at so much per acre. On an average, one handful to four plants works out at 40 to 50 lb. per thousand, and one to six plants at about 30 lb. per thousand. If a few amounts are weighed out the rate of application can be checked and consistency quickly attained. The aim is to place the fertilizer exactly into the lowest leaf bases, and with a little practice it is possible to become expert in giving an equal dose to each plant.

The nutrition of such plants as pineapples has been the subject of much study. It is clear that the number of fruitlets is irrevocably determined by the nutrition of the plant up to the time the bud is formed at the growing point, which is some time before it actually appears. Thus, when the plant has been adequately nourished and the growth status good, there will be a large number of fruitlets and a large pineapple. Subsequent nutrition can only affect the development of the fruitlets. This explains why the pineapple produced by planting an over-large sucker is so small, since its nutrition was arrested and flower spike

formed before it could properly re-establish itself. Therefore, the importance of early fertilizing and the encouragement of strong early growth is evident.

Normally, the first application is given shortly after planting so as to encourage as quickly as possible a wide spreading leaf growth. Between 30 to 40 lb. per thousand is the usual amount. One or two further applications of 40 lb. per thousand will be necessary before the crop is picked. If planting has been done during the latter part of summer, a second application about May-June and another about September will be correct. Ratoon plants may be fertilized at approximately similar periods.

However, because of the shortage of the water-soluble mixture 10-6-10 at the time of writing, this programme may have to be varied. If a suitable organic type of fertilizer can be obtained it may be placed in the soil before planting, and the ration of 10-6-10 thus husbanded for later applications, or for older established plants. If organic fertilizer is used in ratoon fields it would be preferable to work it in among the plants shortly after the crop is off, as disturbance of the soil at this stage will cause least damage to the plants. However, it is for fertilizing established plants that the leaf-base method is so useful, and should be used if at all possible. When placing in the soil, and using 12 cwt. per acre as a basis, the rate per chain of row would be—double rows spaced 7 feet centres, 14 lb.; and single rows spaced 5 feet centres, 10 lb.

Leaf-base fertilizing depends for its effectiveness on adequate moisture either as heavy dew or showers to dissolve the fertilizer and carry it to the roots, thus the plant receives nutrient without root damage caused by soil disturbance. The reason why in the North the new methods did not meet with quite the same success as in the South, where they were developed, seems to be due to two factors: Firstly, not sufficiently realising the necessity of making full use of the comparatively brief period of summer rainfall when choosing the time to plant new areas; and, secondly, that rainfall during the latter part of the year is more often than not too light to maintain growth and give full effect to base-leaf fertilizing.

The remedy is irrigation, which, fortunately is usually available in the main pineapple areas. Spray irrigation is unquestionably the best, and remarkable control over growth and cropping can be attained by it. The amount of water needed is comparatively small, but having the means available to give the equivalent of a light shower when required enables crops to be obtained in quicker time. Furrow irrigation is useful, but not so effective as spray irrigation, and in any case requires a level surface. However, in the drier districts of the North irrigation in one form or another will greatly add to the success of commercial pineapple growing.

Acetylene gas will force plants into flower. Used with judgment and knowledge of local conditions, it is of considerable value to the pineapple grower. By a skilful manipulation of time of planting, acetylene, and fertilizer, the crop can be harvested at a predetermined time, and standover fruit can be eliminated by treating all plants which have not flowered with greater proportion of the crop. With irrigation in addition, even greater control can be established. For tropical conditions, the acetylene solution is prepared by dropping a lump of carbide as large as a hen's egg into a kerosene tin of water. As soon as

the effervescence has subsided it is ready. Approximately 2 oz. is poured into the heart of each plant. If rain falls within twenty-four hours of application, the result may be uncertain and the application should be repeated. This treatment has no adverse effect on the plant treated or its ratoons. The only proviso is that the plant shall be of sufficient development; otherwise the fruit will be small. As a general guide, it will take six or seven weeks from treatment to flowering for Smoothleaves and four to five weeks for Roughleaves, and sixteen to seventeen weeks from thence to picking.

When the soil is not sufficiently acid, sulphur will usually make it so. Some heavy soils will not respond to any reasonable amount of sulphur, but with sandy loams 3 to 4 cwt. per acre is generally sufficient. Advice should always be obtained before a soil is sulphured. Here it should be emphasised that the use of ordinary agricultural lime is, in general, harmful to pineapples.

In cases where sulphur cannot be used and it is obvious that pineapples are lacking iron, it will suffice to spray the plants with a weak solution of iron sulphate at the strength of 6 lb. to 25 gallons of water, this quantity being sufficient for one acre. A very fine mist jet should be used and only a light spray given.

Picking and Marketing.

Picking and handling a big crop requires good organisation to enable it to be done quickly and without damage to the fruit. Short rows and well-spaced tracks help a lot. A good packing place that can be kept clean and tidy speeds up work.

Colour by itself is not a true guide to maturity; climatic conditions render the colour of a mature pineapple very variable. Development of the fruitlets is more reliable, and should vary a little according to the distance of the market. Unless fruit is to be consumed at once, there is a definite advantage in cutting it instead of breaking it off the plant.

Fruit for market must look good as well as be good, and naturally every care is taken not to bruise it, to grade it well, and to pack it neatly in clean cases. A little woodwool is the best packing and looks well.

It is important also to pack the fruit when it is cool and to keep the packed cases as cool as possible during transit.

Diseases.

Pineapples in Queensland are little troubled with diseases and pests in the field. "Wilt" formerly was a serious trouble, but this has been almost entirely eliminated by a suitable acid reaction in the soil and adequate fertilizing. The few scattered cases of wilt in an otherwise healthy plantation are almost invariably due to planting a sucker which was too old.

Black Heart affects the fruit picked about May in North Queensland. This at present is believed to be due to cutting off the plants' water supply by too drastic cultivations at a time when it is maturing a fruit which was formed during the extremely favourable growing conditions of the summer rains.

Sunburn can cause the loss of much fruit. An effective preventive is either a paper sleeve or a tuft of woodwool placed on the fruit, particularly where it is exposed to the western sun.

The fruit rots which become noticeable in transit and in the market are due to organisms entering the fruit tissue through scratches or bruises, and the elimination of all sources of minor damage and clean hygienic conditions in packing operations will reduce them to a minimum.

These are the chief troubles met with; more detailed information on these and others can be obtained from the Department of Agriculture and Stock.

INFORMATIONAL AND ADVISORY SERVICES.

Information and advice on matters relating to primary production may be obtained from the Department of Agriculture and Stock, William Street, Brisbane, B. 7, or from appropriate officers in country centres. The following list shows where Departmental advisory officers are stationed:—

GENERAL AGRICULTURAL CROPS AND PASTURES: Brisbane (Tel. B 1541); Toowoomba; Chinchilla; Warwick; Laidley; Boonah; Kingaroy; Bundaberg (Court House); Monto; Rockhampton (cnr. Bolsover and Fitzroy Streets); Mackay (Court House); Ayr; Home Hill; South Johnstone (Bureau of Tropical Agriculture); Atherton; and Mareeba.

COTTON: Brisbane (Tel. B 1541); Dalby; Kingaroy; Gayndah (Court House); Monto; Biloela (Cotton Research Station); Home Hill; Ayr. All advisors on general agriculture also deal with cotton culture.

SUGAR-CANE: Brisbane (Tel. B 1541); Bundaberg (Sugar Experiment Station, Tel. 228); Mackay (Sugar Experiment Station, Te Kowai, Tel. 17); Innisfail (Tel. 271); Meringa (Sugar Experiment Station, Tel. Gordonvale 95); Cairns (Tel. 2589).

FRUIT AND VEGETABLES: Brisbane (Tel. B 1541); Coolangatta; Southport; Toowoomba; Warwick; Stanthorpe; Wallangarra; Dayboro; Nambour (Field Station, Tel. 175); Gympie; Gayndah (Court House); Rockhampton; Bowen; Townsville; and Cairns.

Advice on vegetable-growing is obtainable also from general agricultural advisory officers.

INSECT PESTS: Specialist Officers at Brisbane (Tel. B 1541); Gayndah (Court House); Rockhampton (cnr. Bolsover and Fitzroy Streets), Townsville.

PLANT DISEASES: Specialist Officers at Brisbane (Tel. B 1541) and Toowoomba (Long Street, Tel. 1990).

IDENTIFICATION OF PLANTS: Brisbane (Botanic Museum and Herbarium, Botanic Gardens, Tel. B 8243).

BEEKEEPING: Brisbane (Tel. B 1541).

SEED-TESTING: Brisbane (Tel. B 1541).

SHEEP AND WOOL: Brisbane (Tel. B 1541); Blackall.

DAIRYING AND CATTLE-RAISING: Officers of the Dairy and Stock Branches are stationed in a large number of country towns.

PIG-RAISING: Brisbane (Tel. B 1541).

POULTRY-RAISING: Brisbane (Tel. B 1541); Boonah (Stock Office).

VETERINARY SERVICES: Brisbane (Tel. B 1541); Yeerongpilly (Animal Health Station, Tel. JY 8005); Toowoomba (Tel. 547); Murgon; Rockhampton; Clermont; Townsville (Animal Health Station, Oonoonba, Tel. Townsville 484); Atherton.

APPLIED BOTANY

Giant Sensitive Plant.*

A VERY SERIOUS WEED PEST IN NORTH QUEENSLAND.

C. T. WHITE.

ONE of the most widely spread weeds in North Queensland is the Common Sensitive Plant (*Mimosa pudica*), a low growing prickly weed on which there has been a good deal of controversy regarding its place in North Queensland agriculture. There is no doubt it is readily eaten by stock, and in its younger stages at least is highly nutritious. Recently, however, there has been introduced a more vigorous species, harsh and unpalatable in the extreme and one that may only be looked on as a most serious pest in the cane fields. Mr. H. G. Knust, Instructor in Cane Culture, recently wrote from Innisfail concerning this plant:—"This weed is causing some concern. It grows much more rapidly than the common Sensitive Plant and if allowed to grow in cane fields soon covers the mature cane and it is not possible to harvest any cane where the plant is established. The only local method used so far is for workers equipped with gloves to hand pull all plants they see, but this is a slow and expensive method. The plant if allowed to spread would become a menace on account of its thick growth and thorny nature."

The Giant Sensitive Plant is a native of Brazil and may be described as a shrub or shrub-like plant, the stems branching and sometimes, as in cane fields, inclined to scramble or climb over other plants. The stems are four-angled and the angles are clothed with sharp recurved prickles. The leaves are finely bipinnate, composed of numerous very small leaflets. The flowers are borne in heads and are similar to those of the ordinary Sensitive Plant. The pods are numerous and are borne in heads. They are about 1 inch long and $\frac{1}{4}$ inch broad, when ripe, and are clothed with small prickles. They later break up into 4-5 one-seeded sections.

This plant has a wide distribution through the West Indies, Mexico and Brazil. The accompanying illustration is from Martius' "Flora Brasiliensis." It is naturalised in Fiji and in a recent paper in the Journal of the Arnold Arboretum for July, 1944, W. R. Greenwood, a keen student of the Fijian flora, states that it appears to have become established in several places on the wet side of Viti Levu.

Undoubtedly this is one of the most serious plant pests that has been introduced into the cane fields of North Queensland and all farmers are advised to keep a sharp lookout for it, and to destroy it immediately it makes an appearance on their properties.

* *Mimosa invisa*.



Plate 96.

GIANT SENSITIVE PLANT OR SENSITIVE BRIAR.

Cretan Weed.*

C. T. WHITE.

CRETAN Weed is a small annual plant, a native of Southern Europe which has been naturalised in the Southern States for some years. Specimens have been received at odd times from the Darling Downs. This year, specimens were sent in by a correspondent at Clifton who states that the weed is appearing in patches here and there in cultivation.

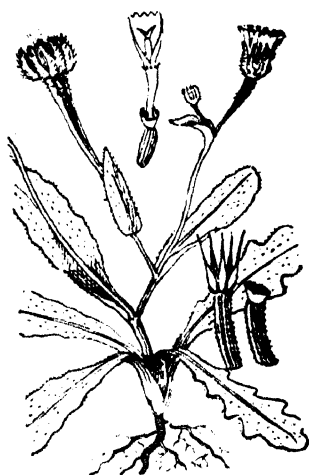


Plate 97.
CRETAN WEED.

It may be described as a small procumbent or erect annual herb, the leaves rather rough to touch. The flowers are yellow and borne in heads. The seeds or achenes are about $\frac{1}{4}$ inch long and finely ribbed. They are of two distinct types; those of the outer series in the head are crowned with a small toothed cup, the inner ones with 4-5 scales ending in a fine point.

It is not known to possess any poisonous or harmful properties at any stage of its growth, but as it may become somewhat of a pest in cultivation because of its free-seeding qualities, farmers are advised to keep a lookout for it and eradicate it when it makes its appearance.

The accompanying illustration is taken from J. M. Black's "Flora of South Australia" and is an excellent representation of the plant.

* *Hedynotis cretica*.

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

Tumbling Mustard.

J.A.R. (Augathella)—

Your specimen is from the Tumbling Mustard, which is a native of Europe and the Mediterranean Region. It is fairly common as a weed. It should be a wholesome plant, except that it would taint the milk of cows which eat it. Its botanical name is *Sisymbrium orientale*, and it belongs to the mustard and turnip family.

Prickly Poppy.

W.L. (Morven)—

The specimen is the Prickly Poppy (*Argemone mexicana*), a very widely spread weed in Queensland. It sometimes smothers large areas, particularly on alluvial flats. It is known under various names, such as California Thistle, Silver Thistle, and Silver Poppy. It belongs to the poppy and not to the thistle family.

The plant has been accused of poisoning stock at odd times, but has an intensely bitter flavour, and this and its prickly nature make it unpalatable. The only deaths recorded have been of poddy calves that had eaten the plants when cut, wilted, and softened a little.

Bracken Fern.

R.L.G. (Conondale)—

The full life cycle of Bracken Fern is from the spore stage up to the adult stage, which takes quite a long time, though the propagation of plants in a paddock is almost entirely from vegetative means—i.e., by spreading and division of the underground root system. Bracken is a pest not only in Australia but in all temperate countries and causes considerable trouble both in Europe and America. Very extensive trials regarding eradication have been carried out in England and Scotland, particularly the latter country, and K. W. Braid, of West of Scotland Agricultural College, has carried out very complete experiments. He mentioned in his report that the bulk of bracken rhizome may be enormous, 5 or even 10 or more feet of it lying below each square foot of surface. This is packed with food reserves such as sugar and starch. All these food reserves are manufactured in the fronds from carbon dioxide obtained from the atmosphere and from water containing mineral matter in solution from the soil. The removal of the fronds therefore (a) prevents the building up of further food supplies and (b) exhausts the underground reserves by inducing attempts to produce new fronds. Theoretically, and this is backed up by experiments, the best time to destroy fronds is when they have just reached their maximum growth—i.e., when they have drained the rhizome but have not begun to contribute food to it. In England and Scotland, this period is from the middle of June to early July. Here it would be, probably, from the middle of November to the end of December. It might even be a bit earlier according to the seasons, but anybody can watch this for himself. In Queensland, many farmers seem to think that better results are accomplished by knocking the fronds down with a stick, rather than cutting them off cleanly with a scythe or brush hook, but this is not thought to be very effective. Bullocks also have been found useful in keeping it under control, because they lie on it and crush the fronds. In a small patch, of course, the best thing is to keep the top foliage down so that the roots must eventually become exhausted. It means constant work for about three years.

Common Weeds Named.

S.H.C. (The Gums, Dalby)—

1. *Lepidium capitellatum*. This and other species of *Lepidium* are popularly known in Queensland as mustard weeds. They are excellent fodders, and stock eat them when they are drying off. They give, however, a rather offensive flavour to milk and cream.
2. *Brassica Sinapistrum*, Charlock. A common European weed naturalised in Queensland. It is one of the numerous members of the mustard and cabbage family known as mustard weed here. It is probably quite a good fodder, but would taint milk and cream badly.
3. *Bidens pilosa*, Cobblers' Pegs. Horses are very fond of the flowering and seeding heads of this plant.
4. Climbing Buckwheat (*Polygonum Convolvulus*). This plant is not a very common weed, but is sometimes seen in cultivation. It is not known to possess any poisonous properties, but where it is abundant stock are sometimes said to suffer from impaction through the fibrous twining stems.
5. *Gnaphalium purpureum*, Cudweed, a very common farm weed in Queensland. It has been reported that this plant, by its hairy fluffy nature, may cause impaction in stock. They do not seem to eat it to any extent, and it is not a particularly aggressive weed.

Mustard Weeds.

W.A.K. (Chinchilla)—

1. *Lepidium hyssopifolium*. This is the common Mustard Weed of the Downs, and is a native plant.
2. *Lepidium bonariense*. This is a comparatively recent introduction first noticed about ten years ago, and now it seems to be everywhere. It is a true mustard not a carrot, but because of the finely divided leaf many people call it carrot. Both taint milk and cream very badly.

PLANT PROTECTION

Predatory Insects.

J. HAROLD SMITH, Senior Research Officer.

FEW farm crops are free from attacks by insect pests and these, in their turn, seldom escape the attention of predators. Such natural enemies include birds, rodents and, probably most important of all, other insects. Some predatory insects, such as the ladybird beetles*, are well known but others are often present on the farm without being recognised as such; indeed, they are sometimes thought to be injurious to crops. It is therefore desirable that the farmer should be able to distinguish useful insects from those which are harmful. The examples discussed below belong to typical predatory groups of insects and it may accordingly be assumed that others with much the same general appearance will have similar habits.

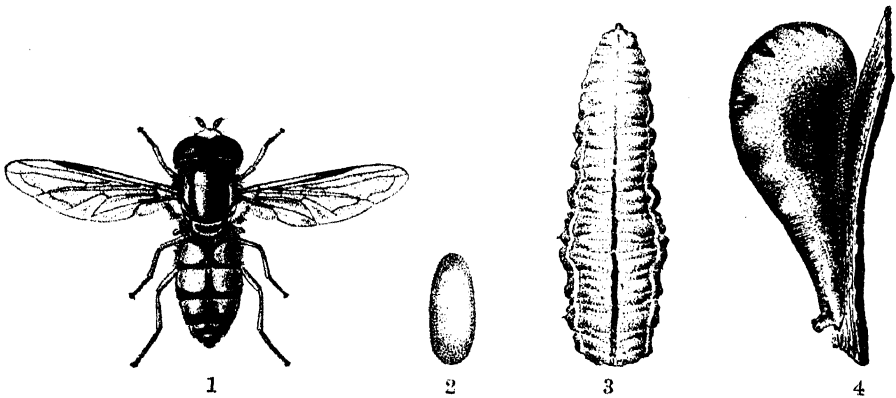


Plate 98.

HOVER FLY: Fig. 1.—Adult $\times 3$; Fig. 2.—Egg $\times 12$; Fig. 3.—Larva $\times 5$; Fig. 4.—Pupa $\times 5$.

[Drawings by William Manley.]

Predatory Flies.

Most of the predatory hover flies (Plate 98; fig. 1) are brownish in colour, have a banded abdomen and vary in length from $\frac{1}{4}$ to $\frac{1}{2}$ inch. They are often seen poised on the wing over flowering plants for relatively long periods and this habit gives them the common name—hover flies.† Their oval, dull-white eggs are laid singly among aphid colonies. From each egg (Plate 98; fig. 2) emerges a minute, slug-like larva with piercing and sucking mouth parts which are inserted into the aphid and through which the fluid contents of the body are removed.

* Ladybird beetles were discussed in this Journal, March, 1944.

† Two of the best known species in Queensland are *Xanthogramma grandicorne* Macq. and *Syrphus viridiceps* Macq.

Three moults take place during development and, at each, the skin is shed to permit expansion and growth. After seven to ten days of almost continuous feeding, the larva (Plate 98; fig. 3) changes to the pupa (Plate 98; fig. 4) which has a typical, tear-drop appearance. Like the larva, the pupa is found in and among aphid colonies on the plant.

A single larva of one of the predatory hover flies may destroy four or five hundred aphids before reaching maturity. As the female is very prolific—she may lay up to five hundred eggs—these insects can, under some conditions, bring an aphid outbreak under control in a very short time.

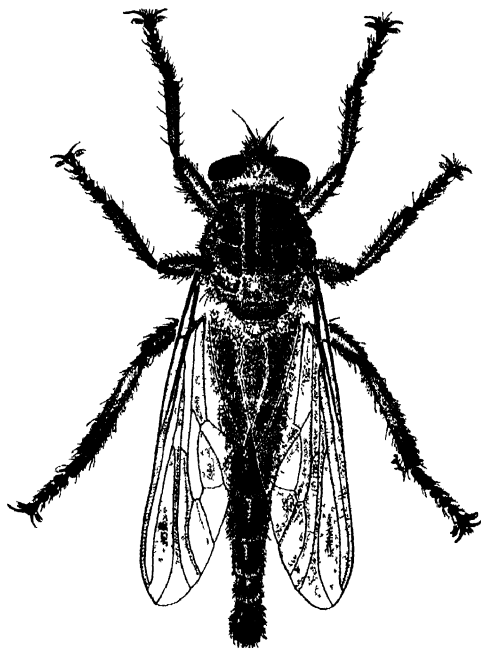


Plate 99.

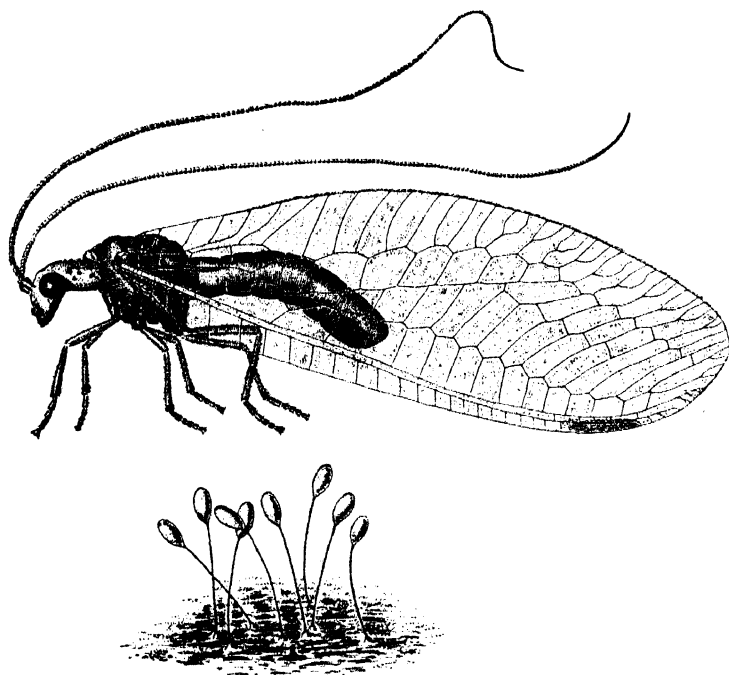
[Drawing by William Manley

ROBBER FLY \times 2.

Robber flies*, or soldier flies as they are sometimes called, are predatory on other insects in both adult and larval stages. They are relatively large insects (Plate 99), blackish-grey in colour, profusely clad with hairs and characterised by a tapering abdomen. The adults catch their prey on the wing but the immature larval stages feed on other insects in the soil. The eggs are laid singly or in small groups in the soil and from them emerge small but very active larvæ. These hunt their prey, which may be almost any kind of subterranean insect, though the white grubs which occur in sugar-cane crops and pastures are preferred. The early life of the larvæ is necessarily precarious for suitable hosts may not easily be found. Those which do survive become less active but continue to feed and grow for at least one year and development may, in some species, extend to even three years. Transformation to the pupal stage takes place in the ground at the completion of larval development; the pupa typically has a series of stout spines at the front and sides of the head. Compared with the larva, the duration of the pupal stage is short and seldom exceeds three weeks.

*A very common species is *Promachus doddi* Ric.

Like many other predators, robber flies attack a wide range of insects, some of which are pests. They are sometimes a nuisance to apiarists as they may capture bees in considerable numbers near the hives.



2

[Drawings by William Manley.]

Plate 100.

PREDATORY LACEWING: Fig. 1.—Adult *Chrysopa* $\times 5$; Fig. 2.—Eggs of *Chrysopa* $\times 5$.

Predatory Lacewings.

The predatory lacewings are very well known to citrus and other fruit growers whose trees are subject to attacks by scale insects, mealy bugs and aphids. There are both green and brown lacewings. *Chrysopa*,* one of the commonest green lacewings (Plate 100; fig. 1) is pale green in colour with long gauze-like wings held roof-wise over the body and extending far beyond it. It is about $\frac{1}{2}$ inch in length and has long, many-segmented antennae. Citrus growers frequently see these insects on the ground when the tents have been removed from the trees after fumigation.

Green lacewings lay their eggs in groups of two to twenty, usually on the leaves of the trees. These eggs (Plate 100; fig. 2) are small and each is mounted on a fine thread-like stalk about $\frac{3}{8}$ inch in length. On emerging from the egg, the larva climbs down the stalk and immediately begins to seek the scale insects, mealy bugs and aphids on which it feeds. These are torn to pieces by the sickle-shaped mouth parts which protrude in front of the head. After killing its prey, the body debris is worked backwards over the head and woven into a protective cover which increases in size until, prior to each moult, little of the actual larva can be seen. When full-grown, the larva pupates on the plant inside an oval,

* *Chrysopa innotata* Brau.

parchment-like cocoon. Towards the end of the pupal period, the lid of the cocoon is forced open by the pupa which then crawls outside before the adult lacewing emerges from it.

The brown lacewings have very similar habits to those of the green lacewings. All species are predatory and some have been used for pest control purposes in countries where pine forests are infested by the introduced chermes, a small aphid-like insect which frequently becomes very numerous and destructive. Except for colour differences, the adults resemble the green lacewings. The eggs of the brown lacewings are, however, not stalked and the larvae never carry debris on their backs. The cocoons also differ from those of the green lacewings, being elliptical and loosely woven, not oval and parchment-like.

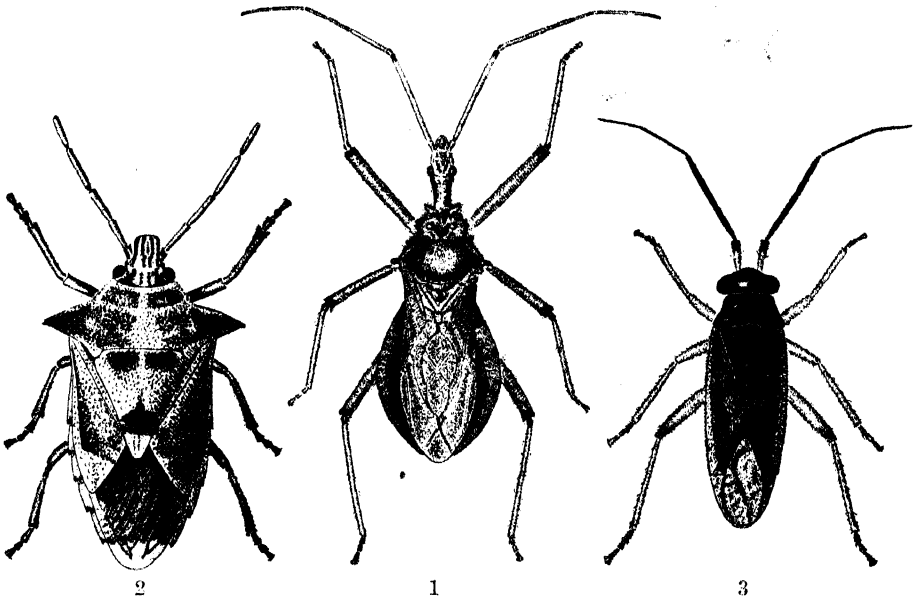


Plate 101.

PREDATORY BUGS: Fig. 1.—The Assassin Bug $\times 1\frac{1}{2}$; Fig. 2.—The Asopid Bug, *Oechalia* $\times 5$; Fig. 3.—The Mirid Bug, *Cyrtorhinus* $\times 10$.

[Drawings by William Manley.]

Predatory Bugs.

The majority of bugs are plant feeders but a few families have developed predatory habits. The common assassin bug* (Plate 101; fig. 1) is probably the best known species. It is about $\frac{3}{4}$ inch long, reddish-brown to yellowish-brown in colour, and has the wings folded within raised ledges at the sides of the abdomen. The mouth parts are formed into a beak which curves in a wide arc beneath the body. The brown, barrel-shaped eggs are laid in groups on the plant and from them emerge the nymphs which, apart from their smaller size and the absence of wings, are very similar in appearance to the parent. Each nymphal stage ends in a moult by which the skin is shed to permit growth. During both nymphal and adult stages, the assassin bug feeds on almost any other insect it can find in either the immature or adult stages. In all cases, the beak is inserted into the body and the fluid

* *Priesthansancus papuensis* Stal.

contents are removed. During outbreaks of caterpillar pests on vegetable and field crops, the assassin bug is commonly seen with a limp grub impaled on its beak.

Shield bugs are normally plant feeding in habit but at least one small group, the Asopids, is predatory. One species*, *Oechalia* (Plate 101; fig 2), is about $\frac{1}{2}$ inch in length, with a rather ornate greenish-brown colour pattern which gives it a tessellated appearance. It has a dark, pointed spine at the lateral tips of the thorax. This bug usually attracts attention when caterpillar pests are active on vegetable and field crops.

A small Mirid bug† (Plate 101; fig. 3) destroys the eggs of a leaf hopper on sugar-cane and was transferred from Queensland to Hawaii some years ago to control the pest. It is usually found in the axils of the sugar-cane leaves where its leafhopper host sucks the juice from the plant. The bug is small, being only $\frac{1}{8}$ inch long, and it is blackish in colour. Both adults and nymphs feed almost entirely on the eggs of the leafhopper which are pierced and sucked dry. The value of this predator is perhaps due to the fact that it prefers leafhopper eggs to other possible foods, that it seldom wanders far from the axils of the leaves where its host occurs and that its reproductive rate is much the same as that of its prey. Its whole life history is thus closely linked with that of the pest which it so effectively controls.

Predatory Ants and Wasps.

Some ants must be considered useful though their habit of nesting around the homestead sometimes makes them a domestic nuisance. Two of the best known are the small, brown, household ant‡ and the much larger, mound ant§. The former is an introduced insect which is now widely distributed in the coastal areas of the State. It lives underground and the workers emerge from several small nest openings and forage for scraps of animal refuse. Blow fly and house fly larvae are attacked when they leave the carrion or dung in which they breed and seek pupation sites in the ground. The adults, too, are destroyed shortly after they have emerged from the pupae and are still unable to fly. Heavy toll of these pests is taken when the ants are at all abundant and there can be little doubt that the fly problem would be much more serious in coastal areas if ant predators of this kind were less abundant. The mound ant, or meat ant as it is sometimes called, is a relatively large species whose nests underlie conspicuous mounds of soil measuring some feet across. Like the small household ant, it feeds principally on carrion and animal refuse but attacks on termite, or white ant, nests are one of the most conspicuous features of its activity. Should the wall of the nest or the several runways leading to it be breached by any mishap, mound ants quickly invade the galleries and remove the inmates to their own nest.

Predatory wasps are usually large, conspicuous insects which frequently attract attention in the field. Each species has a distinct preference for a particular type of victim and these may be flies, spiders, locusts, cockroaches or caterpillars. All are stout-bodied, brown or black insects, often with red or yellow markings. The antennae are many-

* *Oechalia consocialis* Boisd.

† *Cyrtorhinus mundulus* Bredd.

‡ *Pheidole megacephala* Fabr.

§ *Iridomyrmex detectus* Sm.

segmented and the sting comes from the tip of the abdomen and not from the underside as in parasitic species.

Most predatory wasps make some kind of nest in which the young are reared. These nests may be constructed from fragments of mud moulded into a cell, the location and type of which is more or less typical of the species, but those of some gregarious wasps* (Plate 102; fig. 1) are made from a parchment-like material containing fibres of various kinds. Some wasps sting their prey which then loses its power of movement. Often with considerable difficulty, the paralysed insect is carried back to the nest. In some species the nest is provisioned before the

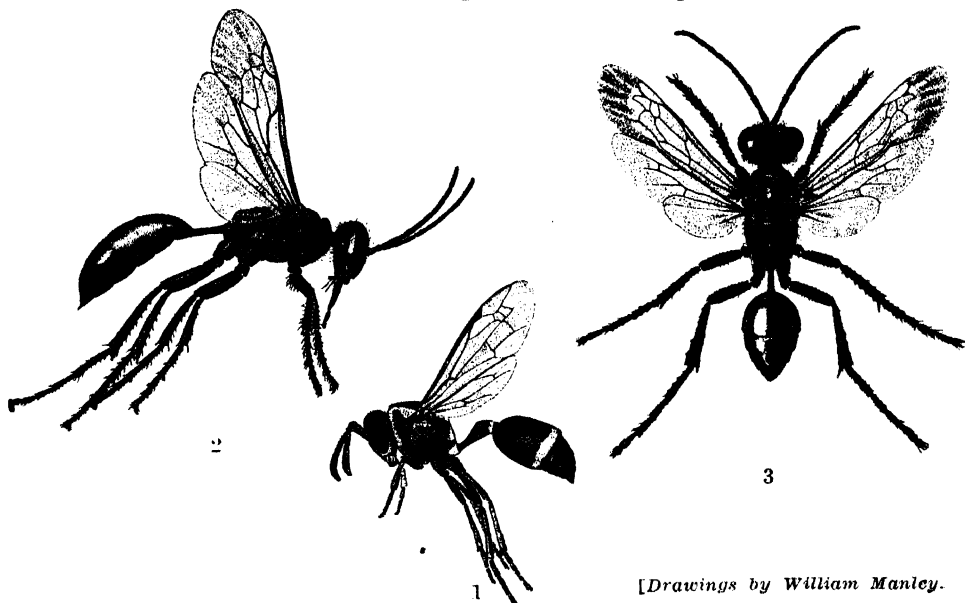


Plate 102.

PREDATORY WASPS: Fig. 1.—The Paper Nest Wasp, *Rhopalidia* $\times 3$; Fig. 2.—The Caterpillar Eating Wasp, *Psammophila* $\times 2$; Fig. 3.—The Locust Eating Wasp, *Chlorion* $\times 2$.

wasp lays its egg in it; in others, the larva of the wasp is supplied with food from day to day. In either case, the immature stages of the wasp develop at the expense of the prey brought to the cell by the parent insect. When full-grown the wasp larva pupates in the cell. From the pupa emerges the adult wasp which breaks through the cap of the cell and flies away to join its fellow predators in the field. Some wasps, particularly those living in communal, parchment-like nests, may feed the young on a specially prepared diet in which captured insects form an essential part.

The activities of wasp predators are conspicuous in the field for large numbers appear among growing crops when caterpillar and locust pests are active. Severe outbreaks of corn ear worm larvae in cotton and tomatoes attract large numbers of the redbanded *Psammophila*† (Plate 102; fig. 2), while small swarms of locusts and grasshoppers are not infrequently wiped out by the black and white *Chlorion*‡ (Plate 102; fig. 3).

* *Rhopalidia gregaria* Sauss.

† *Psammophila suspiciosa* Sm.

‡ *Chlorion saevus* Sm.

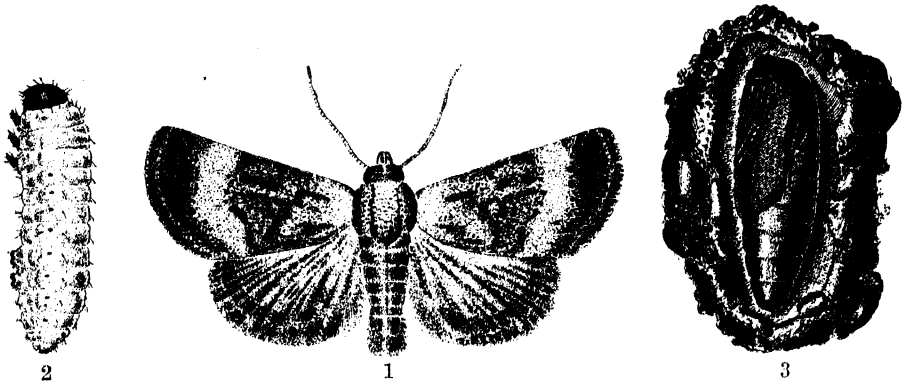


Plate 103.

THE PREDATORY MOTH, CATOBLEMMIA: Fig. 1.—Adult Moth $\times 3$; Fig. 2.—Larva $\times 3$; Fig. 3.—Exposed Pupa in cocoon $\times 4$.

[Drawings by William Manley.]

Predatory Moths.

Though the soft-bodied larvae of the innumerable moths exhibit very diverse habits, only odd groups are mainly predatory on other insects. One of these is closely related to the cutworms and armyworms which are well known pests of cultivated crops. They belong to the genera *Catoblemma*, *Eublemma* and *Thalpochares* and they prey almost entirely on various kinds of scale insects. The common *Catoblemma** (Plate 103; fig. 1) occurs in most citrus orchards, usually in association with the white louse scale which feeds on the trunks and limbs of the trees. When the larvae of this predator are at all numerous, the scale infested bark is covered with a great deal of webbing. The parent moth,

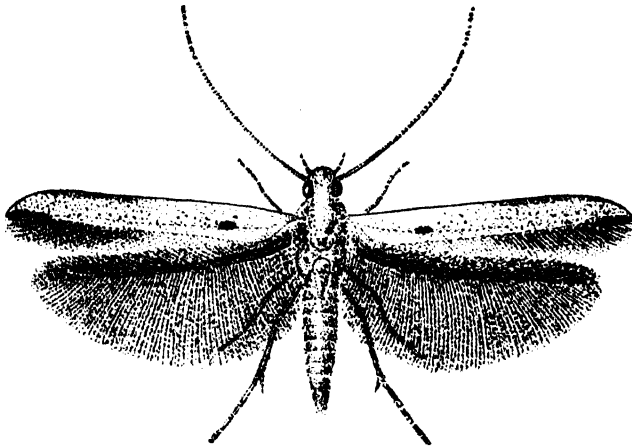


Plate 104.

THE PREDATORY MOTH, BACTRACHEDRA $\times 7$.

[Drawing by William Manley.]

which is rarely seen on the wing, is about $\frac{1}{2}$ inch in length and has the roof-shaped forewings coloured in soft, blue-grey shades. The eggs are laid singly among the scale insects and from each emerges a dull-coloured larva which spins a silken web for its protection. The protective webbing soon becomes cluttered up with the remains of the

* *Catoblemma dubia* Butl.

scale insects which have been destroyed. When full-fed, the larva (Plate 103; fig. 2) pupates within the shelter of the silken cover and later transforms to the adult moth.

Another group of moths also prey on mealy bugs, fluted and pouched scales. A typical species in this group is *Batrachedra** (Plate 104), a minute, greyish moth about $\frac{1}{4}$ inch long with fringed wings, the cream colour of which is broken by a single black spot on each forewing. Its greenish-yellow eggs are laid singly on or near the host insect and the inconspicuous larvæ which emerge from them burrow under the scale insects in the colony and attack them from below. Sometimes the larvæ of this predator are so numerous that two or three feed together under the one insect. Only a little silk is spun by this species and, without careful examination, its activity can only be detected by the presence of pellet-like debris surrounding dead and dying meal-covered insects which have lost their characteristic bloom. When full-grown, the larvæ pupate in silken cocoons from which the adult moths later emerge.

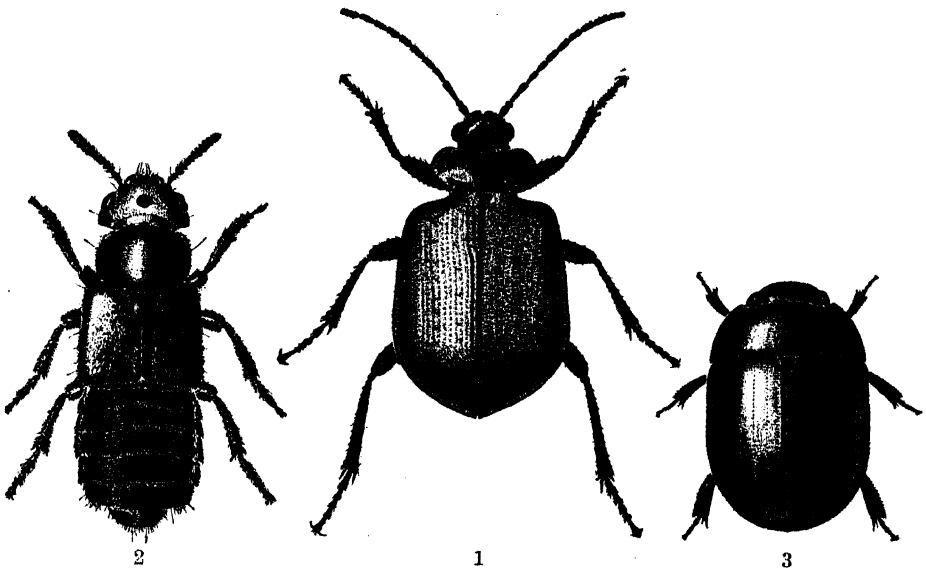


Plate 105.

PREDATORY BEETLES: Fig. 1.—The Ground Beetle, *Calosoma* $\times 1\frac{1}{2}$; Fig. 2.—The Short-winged Beetle, *Creophilus* $\times 3$; Fig. 3.—The Hydrophilid Beetle, *Dactylosternum* $\times 5$.

[Drawings by William Manley.]

Predatory Beetles.

Quite a number of beetles are predatory. The numerous, metallic-black, brown or green, ground beetles commonly found in decaying trash and rubbish are mostly beneficial. One of these, *Calosoma*† (Plate 105; fig. 1)—a large green insect—is not infrequently noticed during cutworm and armyworm outbreaks when it destroys large numbers of the caterpillars in quite spectacular fashion. *Creophilus*‡ (Plate 105; fig. 2), one of the short-winged beetles, is also commonly seen in the field, particularly when the corn ear worm is active. It has

* *Batrachedra arenosella* Walk.

† *Calosoma schayeri* Erich.

‡ *Creophilus erythrocephalus* Fabr.

acquired the apt name, devil's coach horse, from its jet-black body and brilliant red head.

Several rather squat, glossy-black beetles are abundant in banana and pineapple plantations, particularly when cultural practices permit the accumulation of dead leaves, stems and other refuse. These beetles prey on other insects attracted to the same kind of environment and some have been distributed from one country to another to assist in the control of important pests. One of these, *Dactylosternum** (Plate 105; fig. 3), a glossy-black beetle about $\frac{1}{4}$ inch in length, was introduced to Queensland from Malaya some years ago and released in banana plantations where the weevil borer was troublesome. It is now established in some coastal areas.

Fireflies are curious predatory beetles which are well known in the adult stage in both tropical and subtropical countries. The adults are soft-bodied, rather sombre-coloured insects about $\frac{1}{4}$ inch to $\frac{1}{2}$ inch in length and they usually fly at night. Both adult and larval stages are predatory though the latter alone are of any appreciable importance in this respect. Most of them attack snails and are equipped with a very poisonous sting which is almost immediately lethal to the host. Snails may be pests of field crops in irrigated or swampy ground but they are also intermediate hosts of some disease organisms which affect the health of farm animals. Fireflies have thus attracted some interest as a possible control for snails in both this and other countries.

The Importance of Predatory Insects.

The foregoing review of some predatory insects immediately prompts a query as to their value in controlling pests on the farm. The possibilities of using them for this purpose have, of course, been explored ever since biological control became a recognised method of attempting to limit the damage caused by insect pests. With one or two notable exceptions, predatory insects all possess certain disabilities. Among these disabilities is a frequent lack of precision in selecting their prey. Most predators feed on a variety of insects, and the pest species is seldom singled out for attack until it has become very numerous and is already injuring its host plant. A second disability in many predators is their relatively slow rate of reproduction. If a pest is to be kept under control, the predator must at all times be able to maintain itself in sufficient numbers to counter the sharp increases in the pest population which frequently take place. The more important predators are long-lived and reproduce at a relatively slow rate. Rapid increases in the pest population are therefore seldom followed immediately by a proportionately large increase in the numbers of the predator. The failure of a predatory insect to control the pest on which it feeds may also be due to a lack of selectivity in choosing its environment as compared with that shown by the host. Most insect pests have a distinct preference for certain parts of the plants which they attack and, unless the predator has almost identical preferences, it may fail to concentrate on the pest to the exclusion of other insects which occur elsewhere.

The few effective predators are therefore insects which feed on a single pest species or a group of related species, which reproduce at a rate sufficient to keep the proportion of predator to pest at steady values,

* *Dactylosternum hydrophylloides* Macf.

and which habitually prefer the same surroundings as their prey. Any predator which fails to meet these requirements cannot be continuously effective, though it may occasionally be useful. In some instances, it is possible to artificially increase the numbers of an insect predator to meet the requirements of an outbreak by breeding and liberating it on the farm. The procedure is only justified if the probable trend of the outbreak can be forecast with reasonable accuracy or, alternatively, if the cost of so boosting the predator population each year is negligible. Ladybird beetles have been used in this way in some countries where mealy bugs and scale insects are a limiting factor to fruit production.

The Influence of Predators on Pest Control Measures.

Not infrequently the farmer has to decide whether or no insecticides should be applied for the control of a pest when predatory insects are obviously active. Treatment may be unnecessary if past experience with these predators or groups of predators has shown that they are normally capable of eradicating the pest or at least bringing it under control within a few weeks. Thus, if mealy bugs or *Pulvinaria* scales are numerous on fruit trees and the mealy bug ladybird beetle* which feeds on them is common, sprays need not be applied for the control of the pest unless an immediate clean-up is imperative. Similarly, if the trunks of citrus trees are festooned with the webbing spun by the larvæ of the predatory moth, *Catoblepma*, it can reasonably be assumed that the white louse position will ease in the course of a few weeks. Treatment with the lime sulphur spray normally applied in late winter to control it would therefore be redundant. Again, if colonies of aphids appear on cotton or other field crops in pest proportions, the use of the usual nicotine sprays or dusts should only be necessary if ladybird beetles and hover fly larvæ are scarce and failure to control the aphids can, when judged from past experience, be expected to decrease yields.

Unless, however, the farmer is familiar with the significance of both predator and pest populations from long experience and close observation in the field, it is better to disregard the predators and apply the insecticide required to control the pest. Most of the contact sprays or dusts applied for the control of pests such as those cited above have little, if any, harmful effect on the predators, which should therefore survive and later exterminate whatever part of the pest population remains on the trees after treatment.

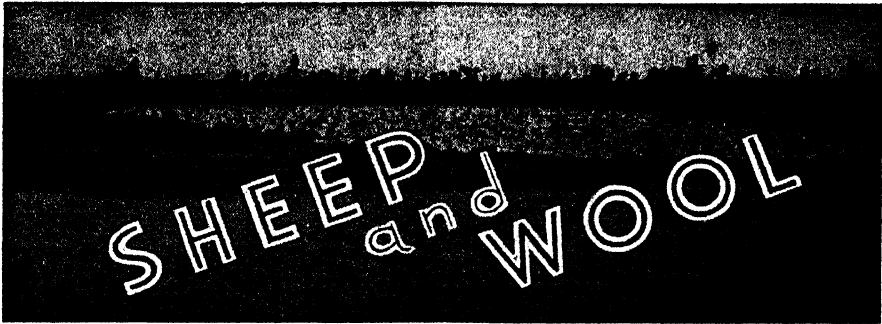
* *Cryptolaemus montrouzieri* Muls.

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The Crossbred on the Farm.

J. L. HODGE.

IT has been amply demonstrated that farmers rearing a crop of lambs on farm lands in Queensland are considerably handicapped if recourse has to be had to merino ewes. To do well, merinos need space and plenty of it. Then again, they do not become domesticated as well as the crossbred, and quietness is a very desirable quality in a farmer's flock.

In advocating crossbreds for the farm, it is well to make plain what is meant is that the progeny should be from purebred stock on both sides. There is an opinion, prevalent amongst some farmers, too, that a crossbred of any sort will do. Nothing could be further from the truth. It is impossible to tell with certainty what the get will be from a line of ewes with a diversity of blood. Uniformity in a line of crossbred suckers is very desirable. "Like peas in a pod" should be the aim of the farmer. The crossbred mother, then, should be the progeny of a purebred sire from a purebred ewe.

There was a tendency, before crossbred wools improved in value, to regard the fleece from a fat lamb-raising flock as of secondary importance. This view should no longer be accepted, for well-bred crossbred fleeces are now very profitable.

The cross recommended for the farmer is got by using one of the long wools with the largest-framed, best-constituted merino ewe procurable. This merino ewe should be as free from wrinkles as it is possible to obtain. The ram recommended is the Border Leicester or the Romney Marsh.

All the ewes dropped as the result of this cross should be retained as the future breeders on the farm. There is a direct economic loss year after year, as the result of sending to slaughter ewe lambs so bred. It is admitted that prices for fat lambs have been very tempting, especially over the past twelve months, but in the interests of both the industry and the individual every effort should be made to reserve these crossbred ewes for the farm flock.

Stock-proof Paddocks Needed.

A disability with all British breeds and their crosses is their fence-fencing proclivities. It is necessary, therefore, that the fencing of the paddocks should be of the best, if the sheep are to be held securely on the areas intended for them. Rams of the Downs breeds, such as the Southdown and the Dorset Horn, should be joined with the crossbred

ewes described for the production of the fat lamb crop. All the resultant drop should be marketed as fat lambs. With adequate feeding, the lambs should be ready for market at from four to five months old, or even younger. As the crossbred ewe flock increases, it should be the object of the farmer to gradually eliminate the original merino ewes. Best prices will, of course, be realised if the ewes are fattened.

Breeding and Feeding.

Some farmers contend that because the sheep in an average farmer's flock are comparatively few, it pays them better to buy crossbred ewes, rather than breed their own flock. There is much to be said in favour of this view, and one must be guided by individual circumstances. The drawback to the straightout purchase is two-fold, namely, the scarcity of the right type of ewe, and the high price one has to pay for it. The Corriedale should be well in the mind of the purchaser of a flock for fat-lamb raising. This general utility breed is fast gaining the favour of farmers, and rightly so. However, with it also the purchase price is likely to be high.

Feeding is of the first importance. Let it be understood at once that dependence on natural grasses, especially in small farm paddocks, can only lead to disappointment. It should be the object of the farmer to have his ewes dropping coincident with the growing crops. All the cereals are recommended. Increasing success is being obtained with grazing sorghums. Lucerne, than which there is nothing better, can be profitably grown on most farms in the fat-lamb areas. Lucerne may be regarded as costly to establish, but it should be remembered that, with care in grazing, the field should last for years. There is the old saying—"half the breeding goes down the neck." This is only half true, but if the farmer breeds right and feeds right, he should have no trouble in participating in the highly profitable prices now ruling, and likely to rule for some considerable time.

Some farmers make the mistake of running too large a flock for the farm. There is more to be made out of a flock of crossbred of lesser numbers, provided suitable ewes are chosen, than a large number of merino or nondescript types. There is wisdom in this maxim: carry only what can be adequately fed.

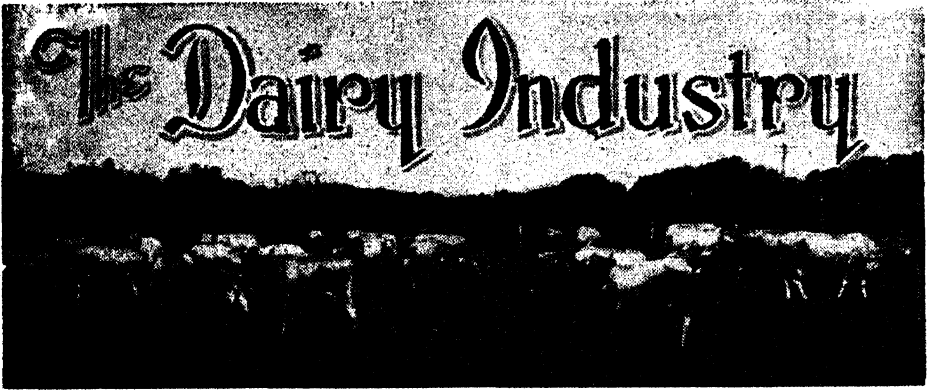
Marketing.

Farm lambs should be marketed as they grow to the necessary weights—33 lb., and truly fat, is a standard sucker weight. All the drop should not be held until the later dropped lambs are ready. To go the desired weight mentioned, a fat sucker lamb on the farm should scale about 60 lb. live weight. Under present conditions, heavier lambs are acceptable to the trade, and if feeding conditions are favourable, even up to 40 lb. dressed weight should be the objective.

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Observations on the Non-stripping of Dairy Cows.

L. E. NICHOLS, Dairy Technologist.

THE urgent need for increased dairy production in Australia under war-time conditions, with its attendant man-power shortage, necessitates the adoption of any labour-saving device or practice which can be successfully applied or adopted. One practice which is steadily growing, and about which hitherto there has been much contention, is the non-stripping of machine-milked cows. In the course of the past two years observations have been made at several farms on the Darling Downs, firstly, on herds during a lactation period in which stripping after machine-milking was regularly followed; and, secondly, during a lactation period after stripping was discontinued.

Notable advances in recent years in studies on the physiology of milk secretion and milk ejection have shown that the old belief, viz., that non-stripping is detrimental, is actually without scientific foundation. Many farmers have also satisfied themselves by actual trial that stripping is not necessary after efficient machine-milking. This break from tradition was forced on them by existing labour difficulties.

The observations now recorded were made with a view to determining the effect of non-stripping on—

1. Milk and butterfat yields and average fat test of milk.
2. Incidence of milk abnormality due to udder troubles and on bacterial count of milk direct from the cow's udder.
3. Length of cow's milking period.

Effect of Non-Stripping on Production and Fat Test.

Six herds, aggregating 400 cows, of the A.I.S., Jersey, and Ayrshire breeds, came under observation. Seasonal conditions during the two lactation periods studied were reasonably comparable. It was the opinion of the dairy farmers concerned that stripping did not pay, as the decrease in production, if any, was slight, and the saving in labour appreciable. In a herd of 50 milking cows, at least one man's time in the milking shed can be saved, thus enabling more attention to be given to more productive farm work. Since adopting the practice, the owner of one of the herds, consisting of 64 cows, has been able to do the whole of the milking and dairy shed duties without assistance. With a four-unit milking plant he has managed the 64 cows, yielding up to 90 gallons of milk each milking, in two and a-half hours.

The average production per cow for the herds under observation was 182 lb. butterfat for the lactation period in which stripping was done, and 181 lb. butterfat in the succeeding lactation when stripping was not practised. The average fat test in both lactation periods was 3.9 per cent.

The table below gives the results of tests made during a milking on four farms to note the quantity of strippings and their effect on the fat test. For this purpose part of the herd was stripped, the remainder not stripped.

					Average Weight of Milk Per Cow.	Average Butter at Test.
					Lb.	Per Cent.
Herd No. 1—Stripped cows ..	..	..	..	..	8.5	3.8
Herd No. 1—Non-stripped cows ..	..	..	..	..	8.0	3.8
Herd No. 2—Stripped cows ..	..	..	..	..	12.75	3.6
Herd No. 2—Non-stripped cows ..	..	..	..	..	12.5	3.6
Herd No. 3—Stripped cows ..	..	..	..	..	14.25	3.9
Herd No. 3—Non-stripped cows ..	..	..	..	..	13.5	3.8
Herd No. 4—Stripped cows ..	..	..	..	..	12.25	3.6
Herd No. 4—Non-stripped cows ..	..	..	..	..	11.5	3.6

In individual herds there was a decrease of 1 to 4 per cent. in total production for the full lactation period, during which non-stripping was practised, compared with the period during which stripping was practised. There was no significant difference in the average fat test.

Effect on Incidence of Milk Abnormalities and Bacterial Count.

Examinations were made in detail while stripping was being practised, and after its discontinuance, to observe the effect of non-stripping on the degree of udder troubles, as diagnosed by recognised milk tests. For this purpose, milk samples from individual quarters of the udder were subjected to the brom-thymol-blue test, leucocyte cell count on centrifuged samples, direct microscopic observation of stained smears and bacteriological plating. Of the six herds at the outset of the investigation, two were apparently entirely free from udder troubles; two had some cows with slight udder inflammations; while the incidence of udder trouble, though not serious, was of some concern in the remaining two herds. The second series of observations, made some time after stripping had ceased in the herds, revealed no increase in the normal bacterial flora of the udder, nor in apparent abnormality of the milk, as assessed by the tests applied. There was actually a tendency towards higher (though not significant) leucocyte cell counts in the milk of cows which were subjected to hand stripping. Likewise, there was no increase in the normal bacterial count of milk taken direct from the udder.

Effect of Non-Stripping on Length of Milking Period.

The comparative production figures already given confirm the fact that the lactation period is unaffected by the non-stripping of cows after machine milking. Almost all cows in the six herds gave a full lactation period of nine months, and many up to ten months. Many cows in these herds were, in fact, found difficult to "dry off" when stripping was not being done, even after the normal nine to ten

months' lactation period had elapsed. A few cows which dried off within six months, and a few which "let down" milk with difficulty, were culled. The dairymen were of the opinion that the culling of these cows was more profitable than to allow them to continue in the herd. As might be expected, the cows in these herds became easier to manage with non-stripping some little time after they had become accustomed to it. No difficulty was experienced in training heifers to these conditions.

Further Observations.

Efficiency of Milking Plant.—Milking machines of several types in common use in Queensland are in operation on farms on which these observations were made, and it is the opinion of each owner that, provided the machines are maintained in good mechanical order, satisfactory milking is assured without the necessity for hand-stripping of the cows. For successful operation in respect of non-stripping the farmers were all agreed that the machines should be operated at the proper vacuum (usually 13 inches), and correct rate of pulsation (45 per minute), that the teat cup inflations should be carefully watched to ensure they do not become slack, and that the teat cups must be removed from the cows as soon as they have milked out. Moreover, the teat cups which tend to work up the teats during milking should be drawn down again by gentle pressure after milking has proceeded about halfway through. Unless this is done many cows do not completely milk out without hand stripping. This step in the non-stripping procedure is regarded as most important.

Individuality of Cow.—The experience gained from observations of 400 cows of different breeds in six herds has shown that there are no practical difficulties in the way of non-stripping. The proportion of cows which do not respond favourably to non-stripping is very small. The results may not be considered by some farmers to be sufficiently conclusive because only six herds were under observation, but research here and elsewhere has shown that the animals suffer no ill effects from incomplete milking. Unsatisfactory animals may be culled, so that a uniform herd which can be milked out by machine without stripping may be built up. Moreover, even if non-stripping may not give entire satisfaction, there still remains the justification for its adoption in many herds as an aid to relieving the existing man-power position.

Cows are creatures of habit and quickly become accustomed to a routine. In the environment of the milking shed, the stimulus to "let down" milk is relatively rapid. This stimulus is only temporary and does not occur more than once during each milking. It is therefore important that the cow should not be bailed up or that preparations for milking—such as feeding, udder washing, rejection of foremilk, and so on—should not be made until immediately before the operator is ready to milk her. Milking should then be promptly begun and continued as expeditiously as possible—normally four minutes for each cow is ample for machine milking. Cows which are disturbed by hastening into the cowyard and bails, or frightened by dogs and noise, may also show a tendency to "hold up" their milk. Cows should therefore be handled as carefully and quietly as possible in the cowyard and bails. Nervous cows or others known to react very readily to the stimulus to "let down" milk might be milked ahead of the rest of the herd. Similarly, cows found difficult to manage without hand stripping might also be milked first in order to facilitate the handling of the rest of the herd.

Summary.

Based on observations on six machine-milked dairy herds extending over lactation periods in which the cows were stripped in one lactation and not stripped in the succeeding lactation, the conclusions on non-stripping are:—

1. Stripping does not pay.
2. Production and fat test are not adversely affected.
3. An appreciable saving in time spent in the milking shed is effected.
4. Less man-power is needed.
5. The incidence of milk abnormalities due to udder troubles is not increased.
6. "Drying off" of cows is not accelerated.
7. A few individual cows may not prove amenable to the practice of non-stripping. These should be culled.
8. Heifers offer no difficulty when the non-stripping system is employed.
9. Efficient operation of the milking plant is necessary—in particular, care should be given to vacuum, pulsation, teat cup inflation, and the immediate removal of the cups after the cow is milked out.

RATIONING OF MILL AND ABATTOIR BY-PRODUCTS.

On and after 1st February, 1945, bran, pollard, blood, and meat and bone meals will be purchaseable only on presentation of a permit, issued by the Department of Agriculture and Stock, Brisbane. If possible, however, a quantity of bran and pollard may be made available through storekeepers for sale in lots of a bushel or less without a permit.

This action is taken under the *National Security (Agricultural Aids) Regulations*, and has become necessary because of acute shortage of these materials. It is imperative, therefore, that whatever supplies are available should be used to the best advantage in primary production.

Any farmer desiring to feed these meals to livestock should make application for a permit to purchase by completing form M.104, supplies of which are now available at all Branches of the Department of Agriculture and Stock throughout Queensland.

Applications close on December 21st and forms should be forwarded to the nearest officer of the Department of Agriculture and Stock, who is conversant with the livestock mentioned therein.

Before 21st December, 1944, sellers of bran and/or pollard in bushel lots or less should make application on form R.695, copies of which are being posted to all known sellers, for a permit to purchase a quantity of these mill by-products for resale.

Poultry keepers producing on a commercial basis and pig raisers will have first call on available supplies of blood, meat, meat and bone meals.

Dairy cattle supplying whole milk for human consumption, calves being reared on a whole milk supply farm, or on a farm where the milk output is being sent to a cheese factory, and poultry kept for commercial egg production will receive first preference with bran and pollard.

Two Types of Combination Milking and Feeding Facilities.

V. J. BRIMBLECOMBE.

BECAUSE of the importance of increased dairy production some form of feeding programme must be adopted to bring about this desired increase on most dairy farms. Lack of farm labour is one of the factors hindering such a scheme, and the plans submitted are offered as systems which will overcome, in some measure, labour shortage.

Plan No. 1.—Milking Shed and Feeding Facilities.

Plan No. 1 shows a combination of milking bails and feeding stalls, which can be adopted efficiently in conjunction with the crush type of Boyce's Patent type of bail. The plan can be arranged to suit up to ten or twelve cows on each side, if necessary.

The feeding troughs are each divided by a fixed partition into two sections, Part I. and Part II. In the centre of the partition a spindle is fitted, about which the troughs revolve, Part I. replacing Part II. by a half turn of the feed boxes. The troughs are square except for the corners which are cut back so that they can revolve within a minimum of space between the sides of the troughs and the adjoining walls.

A rail track leading from the fodder reserve section of the shed is placed on either side of the bails, and a storage trolley large enough to hold sufficient fodder for a complete milking provided for each section of feeding troughs. Before the cows are brought into the bails for milking the necessary rations of fodder and concentrates are measured from the trolleys into, say, Part II. of the troughs and the troughs are then revolving half a turn to bring the fodder, &c., into position at the head of the bails. Part I. of the trough can also be provided with rations at the same time; thus there are two cows' rations ready in each trough before milking is commenced.

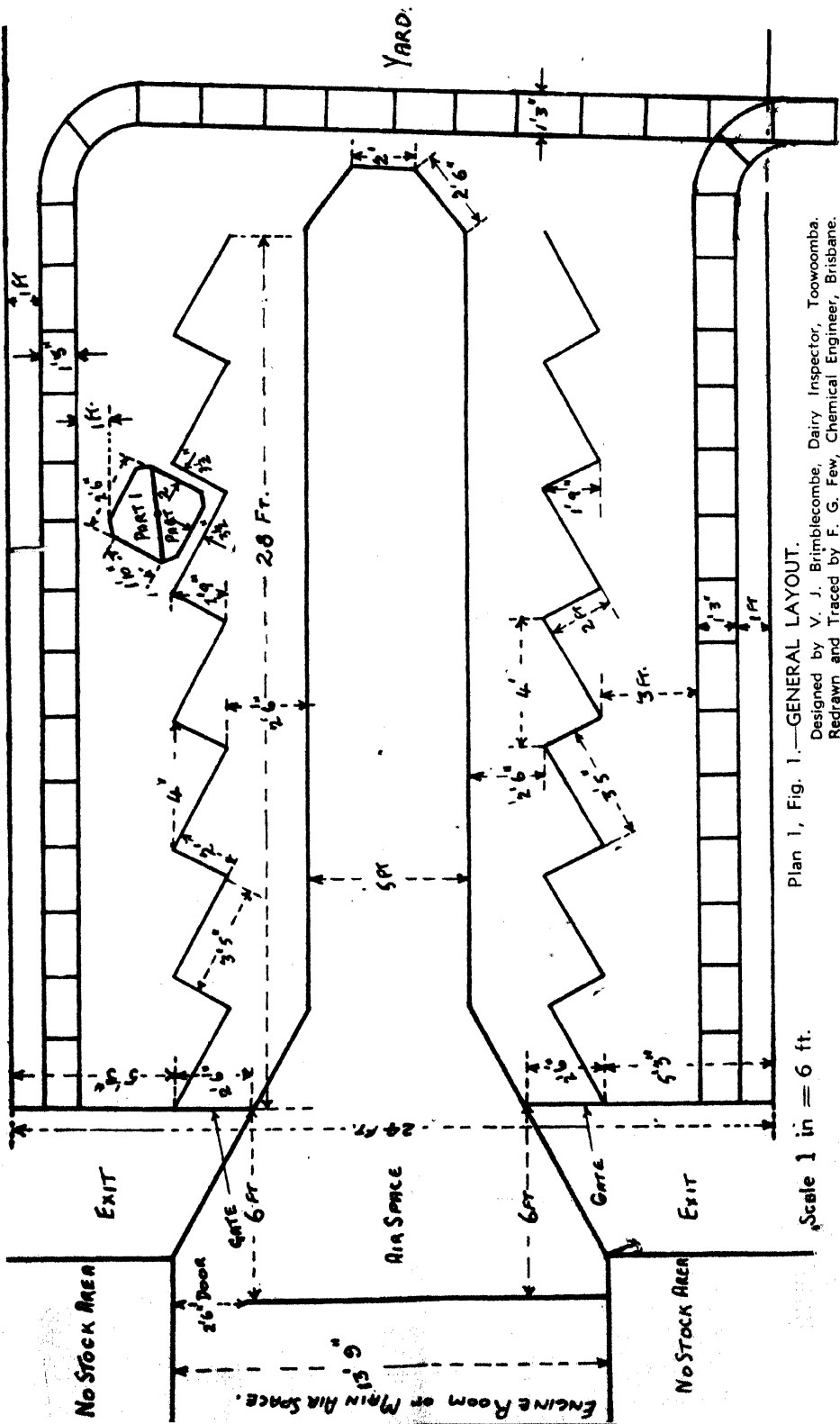
The first sections of cows are milked and fed; and when completed turned out through the exits. The troughs are revolved a half turn to bring the waiting rations into place before the next lot of cows. The empty parts of the troughs can then be filled for the third lot of cows and so the operation continues until milking is completed.

This plan would be more suitable for use in machine-milked herds than under hand-milking conditions.

Plan No. 2.—Plan of Self-Feeder for Protein Chaff and Concentrates at Front of Milking Bails.

The plan is designed primarily for the feeding of concentrates to cows being milked in "walk-through" shed designs, and is in the form of a self or automatic feeding arrangement at the head of the milking bails.

Under normal climatic and seasonal conditions on most dairy farms in Queensland there is usually enough bulky food (roughage) in the form of cultivated crops and grazing pastures to provide sufficient quantities of food to satisfy the appetites of most dairy cows. However, this bulky food is, except during the limited period of its maximum nutritive stage (that is, when not higher than 8 inches), lacking in the

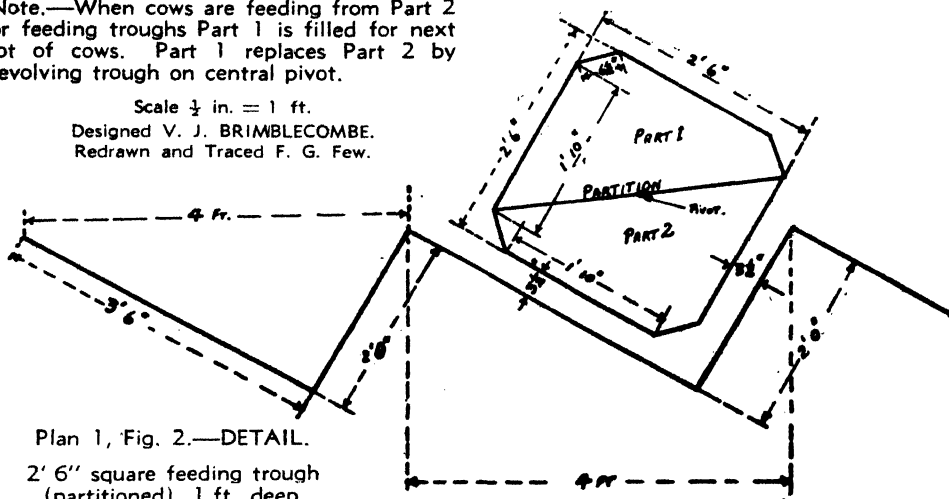


Plan 1, Fig. 1.—GENERAL LAYOUT.

Designed by V. J. Brimblecombe, Dairy Inspector, Toowoomba.
Redrawn and Traced by F. G. Few, Chemical Engineer, Brisbane.
Plate 106.

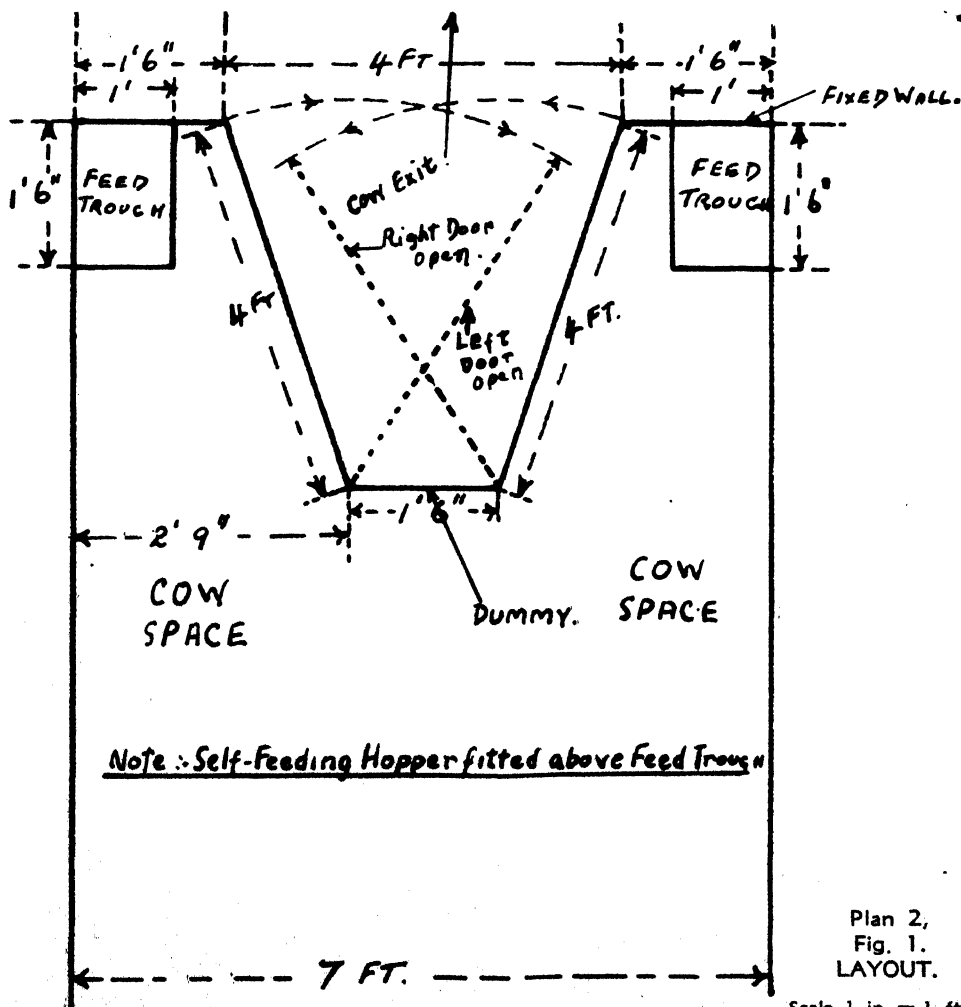
Note.—When cows are feeding from Part 2 or feeding troughs Part 1 is filled for next lot of cows. Part 1 replaces Part 2 by revolving trough on central pivot.

Scale $\frac{1}{2}$ in. = 1 ft.
Designed V. J. BRIMBLECOMBE.
Redrawn and Traced F. G. Few.



Plan 1, Fig. 2.—DETAIL.

2' 6" square feeding trough
(partitioned) 1 ft. deep.



Scale 1 in. = 1 ft.

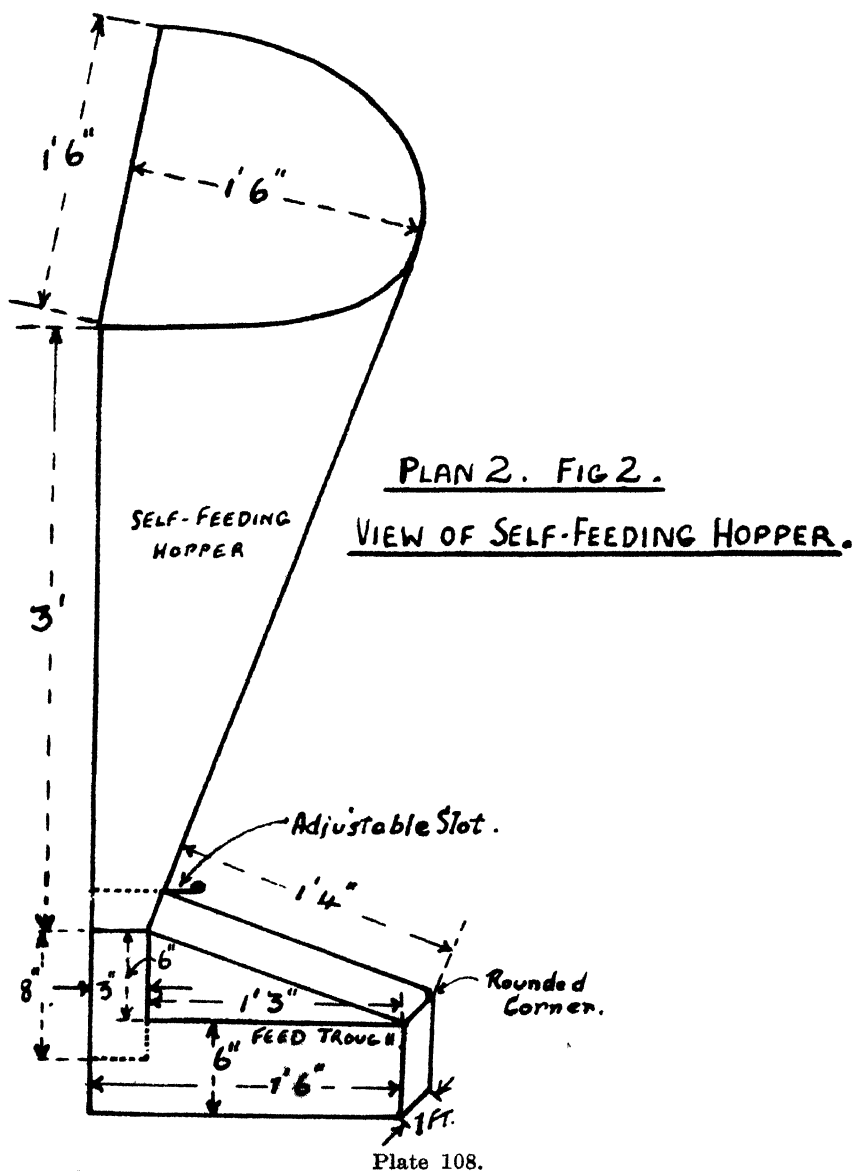


Plate 108.

essential food requirements which make up a balanced ration so necessary for maximum milk production. To obtain maximum returns it is necessary, therefore, for the greater portion of the year, to supplement the forage and grazing fodders with mixed concentrates in the form of crushed grain and protein rich foods. This can be efficiently and conveniently carried out by the adoption of the self feeding arrangement, as illustrated.

To obtain best results with this type of self feeder some modification will have to be made to the usual "walk through" type of bail. Instead of the cow walking straight through the front of the bail in the usual style, she will be diverted through the side of the dummy, and both cows in each unit will have a common exit in front of the

dummy. The head of the bail is constructed as a fixed wall attached to which is a rounded or oval type galvanised iron hopper which acts as a storage for the concentrate mixture. This hopper is tapered down to a feeding trough which is also attached to the wall at the head of the bail, preferably in the corners of the subdividing walls of each unit.

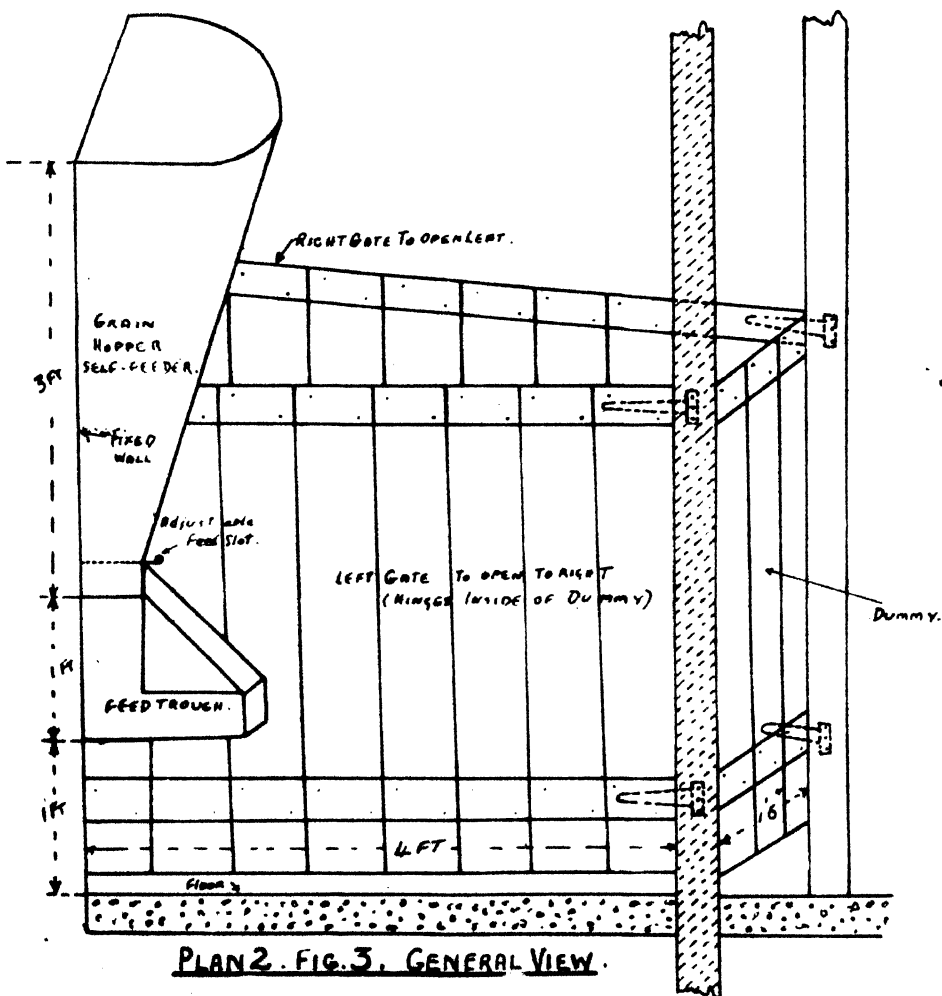


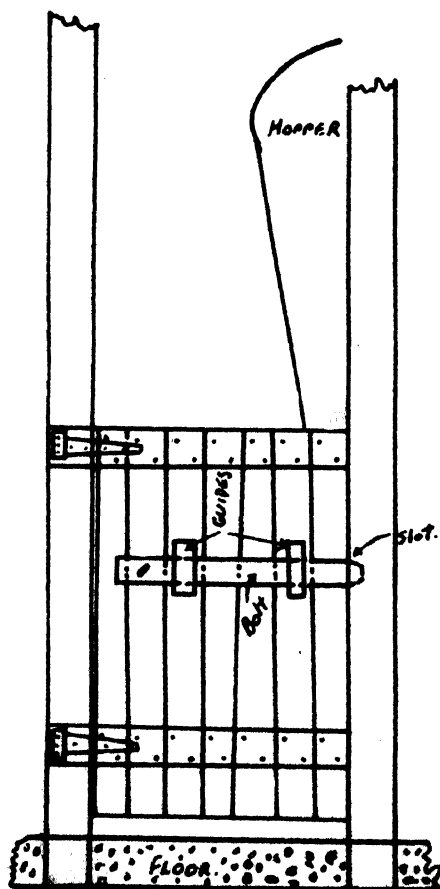
Plate 109.

The exit from the hopper to the trough is allowed to extend to within 4 to 6 inches of the bottom of the trough. Above the trough there is provided an adjustable slot arrangement to regulate the capacity of the flow of grain or other concentrates from the feeder; for example, some cows consume their food more quickly than others, or some low producers or nearly dry cows will not require the usual amount of grain and by pulling out or pushing in of this adjustable slot the supply of concentrates is regulated to these animals, and thus each cow receives approximately the amount of concentrate required in proportion to her production.

As stated, the feeding troughs are placed in the corners of the bails near the dividing walls and the corners of the trough protruding towards the cow space are rounded to prevent damage by the cows during their exit from the bails. Some concentrate mixtures may run from the self feeder more quickly than others and to prevent too rapid a flow a proportion of lucerne chaff may be mixed with the concentrates to retard the rate of delivery. However, it is considered that the regulator provided at the top of the trough will be all that is required.

This self feeding plan allows for the feeding of a large dairy herd with rich foods to supplement poor grazing, &c., with the minimum amount of labour for maximum returns at low cost. Some form of conveyor system which would be still more time and labour saving could no doubt also be arranged to facilitate the conveyance of the concentrates from the fodder reserve part of the shed to the self feeding hoppers.

By the feeding of concentrates in the right proportion as a supplement to pastures, &c., which are incapable of sustaining full yield the production of the majority of the dairy herds in Queensland could be increased by 30 per cent. to 40 per cent. This increase is urgently needed at the present time.



PLAN 2. FIG. 4.

SHOWING WORKING OF LEFT GATE

TO OPEN TO RIGHT.



Coccidiosis of Poultry.

L. G. NEWTON.

COCCIDIOSIS is a disease of the intestinal tract, principally of young and growing stock. Adult birds usually act as "carriers"—i.e., a few parasites are present in the bowel, but are of little consequence except when a bird's resistance is lowered and it suffers a mild, or, less frequently, an acute form of the disease.

Cause—The disease is caused by small parasites called "coccidia," which belong to the lowest form of animal life known as protozoa. These parasites are common to nearly all of the domestic animals and birds, but are markedly host-specific—i.e., the coccidia of rabbits do not affect poultry and the various species which infest fowls do not attack ducks.

Six species are known to infest fowls the important ones of which are *Eimeria tenella* and *Eimeria necatrix*. *E. tenella* is the species responsible for "caecal coccidiosis." It sets up an acute infection, manifested by bloody diarrhoea and pus formation in the caeca or blind guts. *E. necatrix* invades the small bowel, usually being found in the first half of the intestine. It also produces severe haemorrhage.

A third species, *E. acervulina*, which also attacks the upper part of the small intestine, is usually associated with a chronic form of the disease, causing a thickening and furriness of the walls. This type is more common in older birds, while the former types set up acute disease among chickens.

Occurrence.—Coccidiosis occurs most commonly in chickens of 3 to 10 weeks of age, but early hatched birds may escape it entirely while at the end of the season they may be infested as early as within one week. This is, no doubt, due largely to the fact that at the beginning of the season the rearing pens are relatively free of coccidia as a result of cleaning or spelling after the previous season. With each successive batch of chickens, however, the floors become more heavily contaminated by frequent passage of the parasites until at the latter end of the season they are so numerous that the birds are infested as soon as they are placed in the brooder.

Life history of the parasite.—To understand the way in which the disease operates, it is essential to have some knowledge of the life cycle of the parasite. While the greater part of its life is spent in the intestine of the bird the parasite must undergo certain changes outside of the body for the completion of its life cycle. After reaching a certain stage of infection therefore, resistant forms known as "oocysts"

are passed out with the droppings. They have a thick protective covering which enables them to remain dormant in the soil for up to 18 months. Under suitable conditions, changes occur and the oocysts are capable of setting up infection when swallowed. The minimum period required for this process is from one to two days.

When swallowed, the protective covering is dissolved liberating several small parasites which have formed within. Each of these invades the wall of the bowel, and after further development gives rise to many new ones which enter other parts of the wall and repeat the process. The severity of the disease depends on activity of the parasites at this stage. Eventually some of them differentiate into male and female forms, which unite to produce oocysts which are passed out with the droppings as before.

Transmission.—The droppings of infected birds are heavily charged with oocysts, thus contaminating floors, feed hoppers and drinking vessels from which they are picked up by other chickens. Similarly, they are readily carried from pen to pen and farm to farm on the boots of attendants, crates and other fittings.

Symptoms and lesions.—With the caecal form, the lesions are confined to the caeca or blind guts. In severe cases, the chickens lose condition rapidly, become very pale and stand huddled with their feathers ruffled, their wings drooped and they chirp continually. The droppings may contain a considerable amount of blood, soiling the tail feathers and wing tips. With milder infections, there is listlessness, moping, paleness and ruffling of feathers. If closely examined, the droppings also show a brownish colour due to the presence of blood.

Severe outbreaks may involve losses of 50 per cent. or more, particularly among white leghorns, which appear to be more susceptible than other breeds. Deaths usually subside in one to two weeks, but the survivors remain carriers and many are stunted and anaemic and often develop leg weakness.

The lesions are confined to the caeca, which in severe cases are distended with blood the walls being almost completely eroded; in others, the walls may show haemorrhagic areas, while in mild cases, particularly at the end of an outbreak, a core of blood stained pus may be seen.

Intestinal coccidiosis.—This type is usually not as severe as the caecal form. There is a gradual loss of condition, and the birds become anaemic and listless. The droppings are slimy and moist, but blood is not often seen. Deaths are not as sudden as in the former type and occur over a course of some weeks.

If an examination is made after death, the lesions are found in the first half of the intestine, which is usually distended. When opened, erosion, thickening and considerable haemorrhage is seen. In some cases, numbers of greyish spots may be visible from the outside. These are "nests" of coccidia lying in the bowel wall.

Diagnosis.—Acute cases are easily diagnosed by examining the affected organs. Where there is any doubt three or four live chickens showing typical symptoms should be forwarded to the Animal Health Station, Yeerongpilly, for examination.

Control.

As no specific method of control is known, the aim should be to keep the birds as free as possible from infection until they build up a resistance. Since the parasite requires at least 24 hours outside of the host to become infective, cleaning out the pens once daily regularly will give good results. To facilitate cleaning, each unit should be of convenient size, *e.g.* 100 to 250 chickens, and light covering of litter will assist in drying out moisture and prevent the droppings sticking to the floor.

With the semi-intensive and free range systems of rearing, the ground in the vicinity of the houses becomes very heavily contaminated. This can be avoided by using moveable colony houses or "arks" which should be moved weekly.

The inclusion of milk or milk products in the ration has been found of considerable value. A mash made up of 40 per cent. milk, 10 per cent. bran and 50 per cent. maize meal fed for a week helps recovery. Where fresh milk is available it may be allowed to sour and the chickens given as much as they will eat. Irrespective of what ration is fed, the feed hoppers should be so constructed that the chickens are prevented from putting their feet or from passing droppings into them.

Numerous forms of medicinal treatment have been prescribed—*e.g.*, feeding 5 per cent. sulphur, iodised milk, etc.—but their value is limited and if used should be combined with measures of hygiene and sanitation.



Plate 111.

A DAM ON THE CONDAMINE RIVER.—On Mr. Andy Reilly's property, Dalby District, Queensland.



The PIG FARM

Pig Feeding.

M. WHITE, Agricultural Chemist.

THE increased use of white grains, particularly wheat and sorghum, at the expense of maize, has introduced its own nutritional problems. The most readily observed of these is vitamin A deficiency in pigs, though the trouble is by no means confined to this class of livestock.

Brood sows fed a diet deficient in this vitamin not only produce litters with small reserves but nurse them on deficient milk. Mortality rate, under these conditions, is high, and, as the litter, at weaning, is transferred to a diet similar to that of the mother, there are continued losses.

The symptoms, at first, are somewhat vague. The farmer usually notices that the litter is not "doing well" and is subject to all the minor ills which affect young pigs. Pneumonia is common and death often supervenes. As the malady develops the more obvious symptoms appear, such as impaired vision, eye lesions with keratinous scales, continued restlessness and inability to control leg movement. Animals in the advanced stages are unable to "track" properly and eventually drag or skate the paralysed hind quarters. There is generally a marked swinging of the head as if the animals were observing the functionless legs. These symptoms follow nerve degeneration through bone pressure in the foramina. The optic, sciatic and femoral nerves together with parts of the spinal cord are most affected.

Treatment consists of supplying foods rich in vitamin A before the gross symptoms develop. Fish liver oils are excellent but supplies are limited. The simplest method the farmer can adopt is to include green feed or yellow vegetables in the ration. The price of maize and its scarcity preclude its use. It is too often forgotten that pigs are omnivorous and that one-third of the growing ration may be obtained from grazing. Dry sows may obtain two-thirds of their foodstuff in the form of green food during the first half of the gestation period.

By this system of feeding with brood sows the risk of sterility is obviated, the reserves of vitamin A for future use are built up and the young, both before and after birth, are assured of adequate protective vitamins so crucial in the first two months of their existence.

The second disorder which is becoming more marked since cheaper grain for feeding has outstripped supplies of skim milk and meat meal to balance the ration is lime deficiency. Restricted supplies of lime-rich foods together with increased allowances of cereals which contain the lime-robbing phytin has resulted in a marked drop in the calcium (lime) intake of pigs. The faster animals grow the greater the call for lime and if this demand is not met a well defined series of disorders occurs. Sows frequently farrow stillborn pigs. Those that are alive are unthrifty due to poor skeleton formation and to the fact that lime deficiency lowers milk production to such an extent that they are undernourished. Growth is retarded, and stunted, ill-shaped pigs with a habit of chewing all manner of foreign materials result. Bone fractures are common even at market weights when the lime requirements of the pig are not so insistent. The difficulty is largely overcome when grazing or ample legume hay is provided. It is adequately met when the source of protein for balancing is meat meal or separated milk. When these are in short supply a lime supplement is necessary. It may consist of powdered marble (limestone), sterilised bone meal (or burnt bone) or aged wood ashes—particularly from hard woods. Mixtures of any or all may be used. Even gypsum is a source of lime for pigs. Sows and growing, *i.e.*, not fattening pigs, should have first call on what is available. Up to one pound added to each 100 lbs. (dry weight) of food may be given or alternatively a mixture of equal parts sterilised bone, powdered limestone and wood ashes, with charcoal included, to which is added about 10 per cent. of salt may be kept in a heavy stout container where the animals have free access to it.

TO RID PIGGERIES OF FLEAS.

For ridding premises of fleas, a preparation which has proved successful is a mixture of 2 oz. of tobacco dust and 4 oz. of naphthalene. Sprinkle this around the pens, sties, and sheds once weekly. A useful insecticide spray for fleas and other pests, which may also be used as a household spray, is made up as follows:—One gallon of liquid ammonia, 4 lb. best white soap, 8 oz. of saltpetre, and 8 gallons of soft water. To make, chip the soap finely and pour the water over it, then boil until dissolved. Allow to become cold and then add saltpetre and stir until dissolved. Strain, let the suds settle, skim off the dry suds and add the ammonia, then bottle and cork. Another effective method is to heavily spray the sheds and sties with kerosene emulsion after thoroughly cleaning and ridding them of all accumulation of cobwebs, rubbish, dusty bedding, and other litter. Walls and floors should be sprayed and the spraying repeated two or three times.

If the pigs are infested, spray with the kerosene emulsion or wash them with a 3 per cent. solution of creolin and water, or any other standard creosote compound. Kerosene emulsion may be made according to the following formula: 1 lb. hard soap, 1 pint kerosene, 1 gallon of water. Boil the water, add the soap, and when it is dissolved remove from the fire and allow to cool slightly, then add the kerosene and stir well until emulsified.

FARM ECONOMICS

The Feed Grain Position in Queensland.

C. H. DEFRIES.

A REMARKABLE development in Queensland agriculture during the past few years is the steady increase in the aggregate area sown to feed grains. Feed grains include barley, oats, sorghum, maize, and wheat, but the increase in the total is largely the result of the rapid expansion in the production of oats for grain and the dwarf grain sorghums. The total area of these grains, excluding wheat, planted for feed in the 1943-44 season was 253,070 acres. This was an increase of 17,000 acres over the plantings for the previous season, and represents an increase of 44 per cent. over the average plantings for the three-year period, 1934-35-36. The yields of these crops showed an even greater increase in the 1943-44 season, but this was of course partly due to the favourable seasonal conditions then prevailing. The average yield of grain sorghum in the State, for instance, was 26 bushels per acre, as compared with the previous year's average of 18 bushels per acre. The total yield of grain was over 6,000,000 bushels as against 4.7 million bushels the previous year. Wheat is not included in these figures, but approximately 2½ million bushels are now being used annually by the poultry and pig industries. In the tables numbered 1 and 2 are set out the areas of feed barley, oats, maize, and grain sorghum planted each year, and the annual production of each of these crops during the past ten years.

The area sown to barley and oats declined considerably from 1939 to the 1941-42 season, although there has been a good recovery during the past two seasons. The acreage under oats has in fact increased considerably above normal. However, the decline in barley and oats was compensated for by an increase in the area of grain sorghums and maize in 1940-41. Since 1941, however, the area planted to maize has again fallen, and in the 1943-44 season was below normal plantings. The plantings of grain sorghum on the other hand have shown a steady upward trend. These fluctuations and trends of the areas sown to the four main feed grains are illustrated by the charts No. 1 to 4.

Great as the increased production has been, it should properly be considered in relation to the demand for the grain and the clear fact is that the demand for feed grains by the poultry and pig industries at the present time is growing at a much greater rate than the available supply. In other words, the numbers of pigs and poultry in Queensland have been increasing during the past few years at a rate greater than the production of the necessary feed grain supplies.

TABLE No. 1.
THE AREA OF FEED GRAINS IN QUEENSLAND FOR THE PERIOD, 1934-1944.*

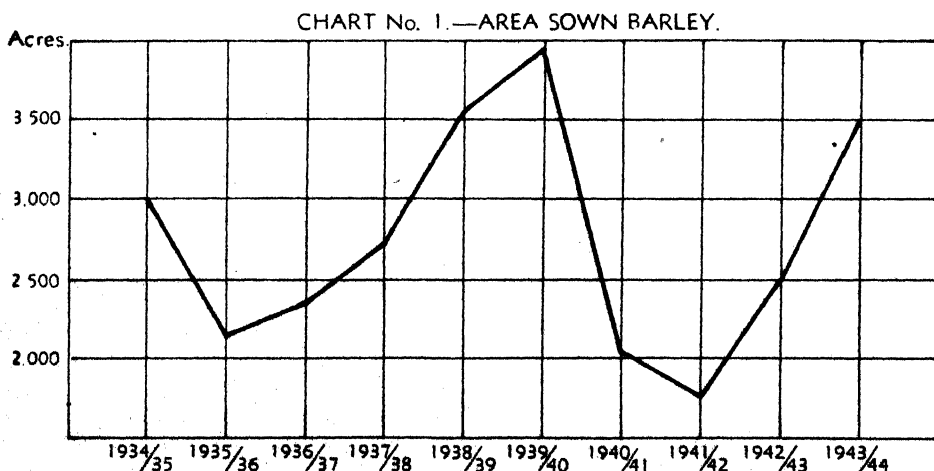
Year.	Feed Barley.	Oats.	Sorghum.	Maize.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.
1934-35 ..	3,004	4,566	..	160,607	168,177
1935-36 ..	2,095	6,823	..	157,370	166,288
1936-37 ..	2,333	7,932	..	181,266	191,531
1937-38 ..	2,732	7,709	..	174,243	184,684
1938-39 ..	3,685	8,650	..	183,415	195,750
1939-40 ..	3,929	11,595	4,397	176,844	196,765
1940-41 ..	2,115	7,162	9,852	205,310	224,439
1941-42 ..	1,780	8,050	25,340	174,450	209,620
1942-43 ..	2,504 ^a	19,103	40,630	173,816	236,053
1943-44 ..	3,562 ^a	22,104	54,685	172,722	253,070

* Source : Government Statistician, Queensland.

^a Six row barley, i.e., Cape and Skinless.

TABLE No. 2.
PRODUCTION OF FEED GRAINS IN QUEENSLAND FOR THE PERIOD, 1934-1944.

Year.	Feed Barley.	Oats.	Sorghum.	Maize.	Total.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1934-35 ..	45,016	82,198	..	4,142,079	4,269,293
1935-36 ..	26,475	119,459	..	3,504,000	3,649,934
1936-37 ..	10,076	22,417	..	3,149,000	3,181,493
1937-38 ..	36,423	79,323	..	2,628,458	2,744,204
1938-39 ..	62,004	93,128	..	3,733,424	3,888,566
1939-40 ..	66,880	199,766	62,074	3,344,853	3,673,573
1940-41 ..	34,459	75,984	207,834	4,444,474	4,762,751
1941-42 ..	23,620	66,770	387,840	3,987,970	4,466,200
1942-43 ..	58,426	92,248	742,872	3,798,072	4,691,618
1943-44 ..	69,555	129,692	1,428,292	4,511,754	6,139,293



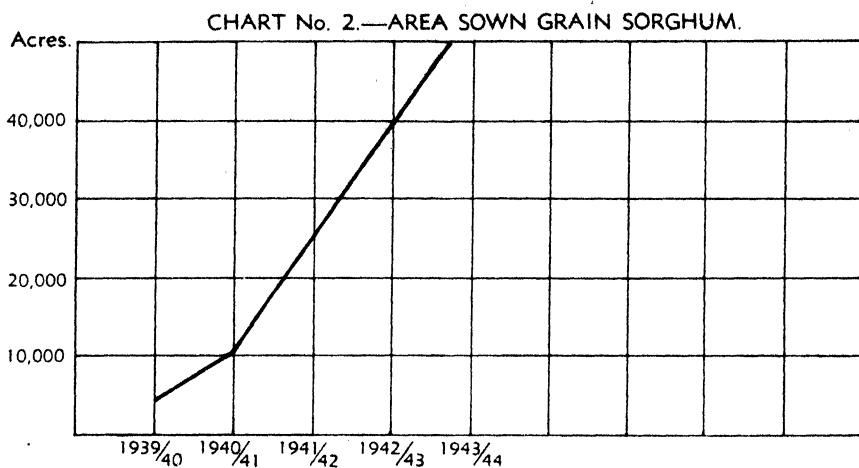


Plate 113.

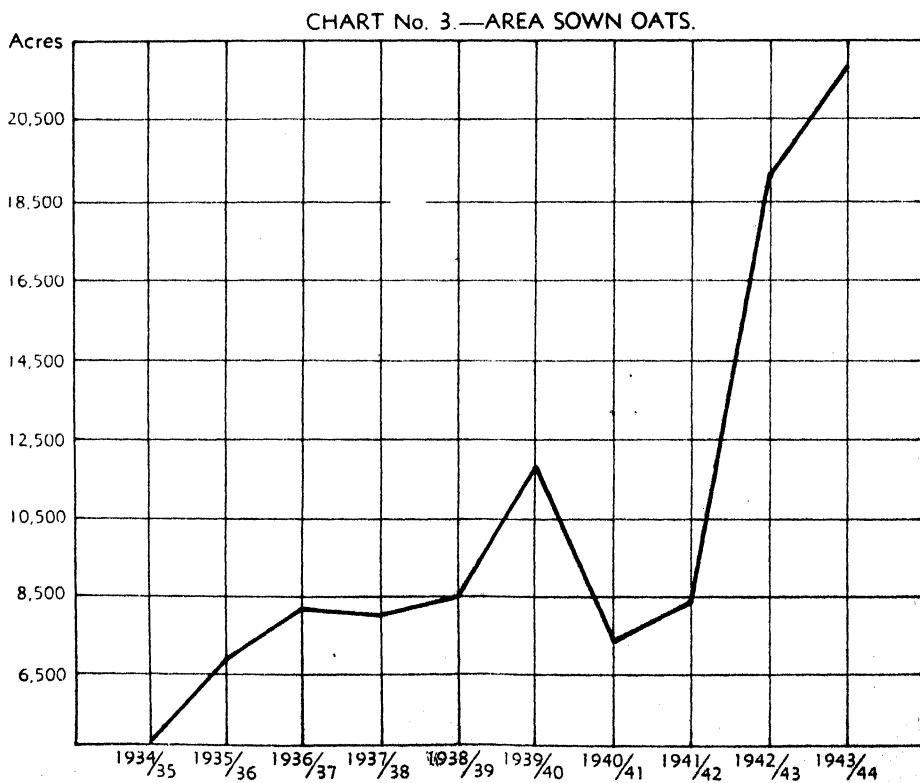


Plate 114.

CHART No. 4.—AREA SOWN MAIZE.

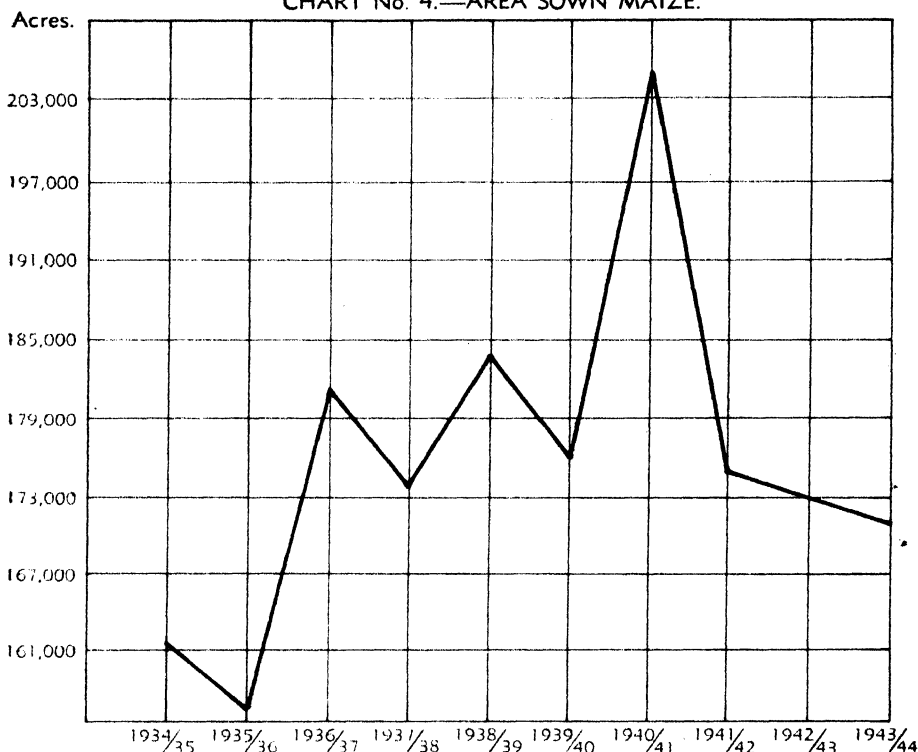


Plate 115.

The decline of the dairying industry and consequent diminishing supplies of skimmed milk for the feeding of pigs, combined with the increasing use of milk for cheese production has accentuated the shortage, but the failure of feed grain supplies to keep up with the pig and poultry population would have occurred in any case.

TABLE No. 3.
PIG AND POULTRY NUMBERS IN QUEENSLAND, 1934-44.*

Year.	*Numbers of Pigs as at 31st Dec.	*Numbers of Poultry as at 31st Dec.	Indices for each Year Based on Average of 1934-35-36 = 100.		
			Pigs.	Poultry.	Area of Feed Grain Sown.
1934	269,873	1,227,000	94	100	..
1935	304,888	1,238,000	106	100	96
1936	290,855	a	104	..	95
1937	282,941	a	98	..	109
1938	325,326	a	113	..	105
1939	391,333	a	135	..	112
1940	435,946	1,382,507	151	112	112
1941	352,360	1,442,123	122	117	128
1942	434,458b	1,132,445c	147	92	120
1943	409,348b	1,840,029d	142	149	135
1944	450,391b	2,119,760d	156	172	144

* Source: Government Statistician, Queensland.

a Not available

c As at 30th June.

b As at 31st March.

d As at 31st March.

Table No. 3 shows the numbers of pigs and poultry in Queensland as at the 31st December of each year (except where otherwise stated) for the period 1934-44. In order to give some indication of the degree to which the population has increased, the three-year period, 1934-35-36, has been adopted as a base, and the percentage increase or decrease variation from the average population of this period is given in columns 3 and 4. An analysis on similar lines of the total area of feed grains planted is shown in column 5. The same base was chosen.

It will be seen that there has been a substantial increase both in poultry and pig stock numbers during the past ten years to the extent of at least 72 per cent. in the former, and 56 per cent. in the latter; this is a probable underestimation. The increase in the area of feed grains planted has been only 44 per cent. over the same period, and, of course, not all of this grain has been fed to pigs and poultry, some was required for industrial purposes and processing. This lag in the rate of increase of the total area of feed grains behind pig and poultry numbers is illustrated by the following chart.

CHART No. 5.

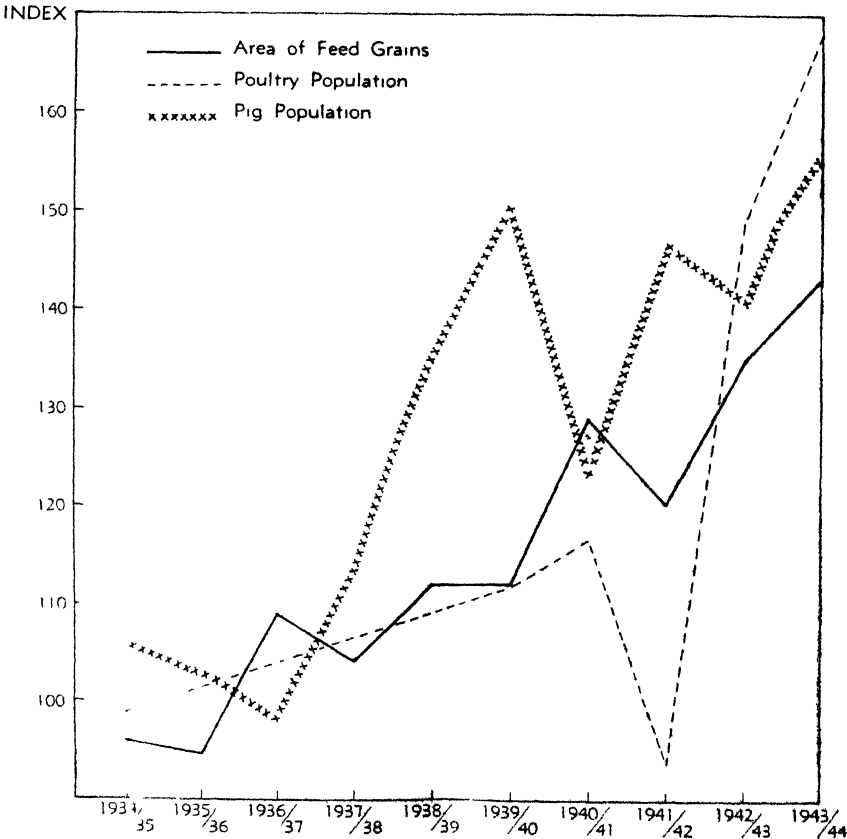


Plate 116.

ILLUSTRATING THE VARIATIONS OF NUMBERS OF PIGS AND POULTRY IN QUEENSLAND AND THE TOTAL AREAS SOWN TO FEED GRAINS FROM 1934 TO 1944.

Up to last season no great problem was involved, but if present trends continue, it is difficult to see how a serious position can be avoided. The production of feed grains last season shows a very gratifying rise, but this was the result of a particularly favourable season, and should there be no further increase in the areas sown or even if only a normal season is experienced a shortage is bound to occur.

This problem is not by any means confined to Queensland. It is present in other parts of the Commonwealth and other parts of the world. In the United States of America an acute shortage of feeding grains has developed. The Iowa Farm Economist* reports that the nation is using feed grain at record rates, and that animal numbers have caught up with the supplies. It is interesting to note that the conclusion reached in that country is that the nation's livestock industry has reached the end of the expansion of the last few years. This, of course, has particular reference to the cattle industry, as normally large quantities of feed grains are absorbed in this industry.

In normal times, the lag in feed grain supplies would be made up by the use of wheat either produced in Queensland or imported from other States. Every effort is being made to maintain supplies from the South, but transport difficulties cause uncertainties and irregularities in delivery.

The position therefore is not in doubt. Assistance from outside the State in the way of imported grain will be obtained only with difficulty, and the more Queensland is able to rely on its own production, the more secure will the position of the pig and poultry industries in this State become.

* Iowa Farm Economist, Volume X, No. 1-2, Page 3, January, 1944.



Plate 117.

A COMBINATION OF THE PADDOCK AND THE GRAZING SYSTEM.—A disadvantage of this system is that the pigs tend to spend too much time eating maize and too little time grazing over succulent pasture; an hour or two of grain feeding daily is enough, and there should be plenty of clean drinking water for the pigs.

GADGETS AND WRINKLES

LAND AREAS.

MEASURE OF SURFACE.

484 square yards } 1 square chain
10,000 square links }

10 square chains }
4,840 square yards } 1 acre
100,000 square links }
4 roods }
160 perches }
640 acres 1 square mile

MEASURE OF LENGTH.

7.92 inches = 1 link.

5½ yards } = 1 pole or rod
25 links }

100 links }
22 yards } = 1 chain
4 poles }

8 furlongs }
80 chains } = 1 mile
1,760 yards }

A paddock 40 chains square would be

$$40 \times 40 = 1,600 \text{ square chains.}$$

$$1,600 \div 10 = 160 \text{ acres.}$$

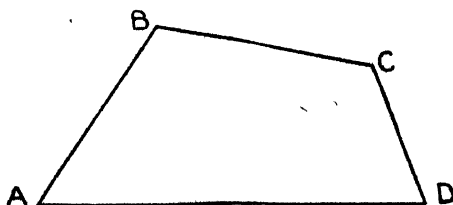
A paddock 70 chains long by 40 wide would be

$$70 \times 40 = 2,800 \text{ square chains.}$$

$$2,800 \div 10 = 160 \text{ acres.}$$

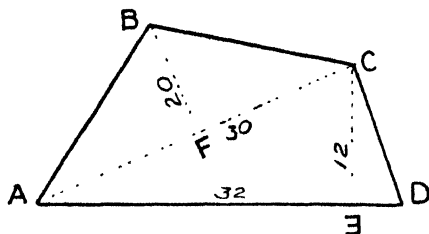
Rule.—Multiply length in chains by width in chains, and divide by 10 for acres. This applies only where all the fences are at right angles.

When paddocks are of irregular shape, they must be divided into triangles, the contents of each triangle ascertained, and their acreage added together.



As this paddock has no right angles, the rule on page 17 does not apply to it.

A line must be drawn across from corner to corner, dividing it into two triangles, thus:—



(The numbers in the figure are chains.)

Area of A B C D = area of A B C + A C D.

On the line A C draw the perpendicular line B F.

$$\text{Area of A B C} = \frac{B F \times A C}{2} = \frac{20 \times 30}{2} = 300.$$

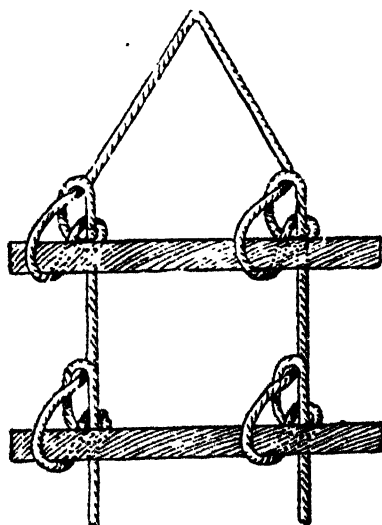
On the line A D draw the perpendicular C E

$$\text{Area of A C D} = \frac{C E \times A D}{2} = \frac{12 \times 32}{2} = 192$$

Total area = 300 + 192 = 492 square chains.

Divide by 10 to bring to acres.

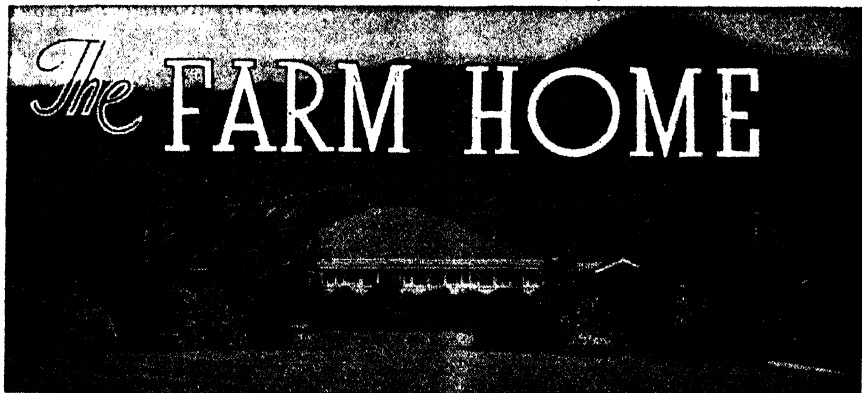
= 49 acres 2 square chains or 49½ acres.



STRONG ROPE LADDER.

A ladder made on the simple principle, illustrated, has the advantage of being rigged in a few minutes and dismantled in as many seconds. Rungs may be of any material strong enough for the purpose, and are safer than pieces of timber with holes bored in them because unless the wood is very tough, it is likely to split. Hang, as shown, otherwise the knots will slip. Lower sketch shows the same knot used in providing a swinging scaffold, made from single plank with knot at each end.





Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

CAN CHILDREN BE PROUD OF THEIR TEETH?

A DISCUSSION was overheard the other day between two young women who decided finally that the most important attributes to a good appearance are skin and teeth. In a previous article the care of the infant's skin was dealt with. The same care can be continued into adult life, and with the very important addition of the right kind of food a good complexion should be assured.

In these days, it is not uncommon to see children with nice complexions, but with bad teeth. At least half of the children attending the toddlers' health centres attached to this service have several teeth actually decayed, many more have badly formed and badly spaced teeth, and a perfect set of teeth in a child reaching school age is unfortunately a rarity.

Teeth should be beautiful structures—they should enhance the appearance, prove satisfactory tools for chewing the food and last a lifetime. If the teeth are ugly—misshapen, decayed or overcrowded—someone has been at fault, and amongst the things which mothers and fathers should study in a programme for healthy living is the story of the teeth.

We have two sets of teeth, the baby or milk teeth—twenty in all, and the second or permanent teeth—thirty-two in all. Teeth are divided up into different types. There are the front teeth or incisors which are for biting, the eye teeth or canines which are the tearing teeth, the teeth behind the canines called bicuspids which both tear and crush, and finally the molars or grinders. Each of these teeth should bite against the corresponding tooth in the opposite jaw. If they do not, it is impossible to chew properly and the teeth and gums may suffer injury. Every tooth has a particular job to do, and when one has gone the whole of the teeth on that side become inefficient. If the teeth cannot do their work, the food will be swallowed in large pieces and chronic indigestion may result. A child needs correctly placed teeth in order to speak plainly, as the teeth are used in articulating certain words.

If the teeth are decayed, the entire health of the body can be affected, sometimes seriously, as it is now known that diseased teeth provide entrance for germs into the bodily system. Abscesses at roots of teeth drain into the blood vessels, and the poison from them goes with the blood into every part of the body; if this continues, the general health is obviously affected.

In next month's article parents will be told how to care for these very important structures, so that their children will not suffer because of their lack of knowledge. In the meantime, questions on this or any other subject concerning maternal and child welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.**For Dinner.***Meat Roly Poly.*

Take 4 oz. shredded suet, $\frac{1}{2}$ lb. liver or cold meat, 1 onion, 1 cup water, $\frac{1}{2}$ lb. flour, $\frac{1}{2}$ teaspoon salt, 1 cup gravy or stock.

Chop the liver or meat and onion. Mix with flour, shredded suet, and salt. Moisten with the water to make a fairly stiff paste, roll lightly and shape into a roll. Lay roll on a scalded and floured pudding cloth. Roll up in cloth and secure ends tightly. Place in a saucepan of boiling water and boil for two hours. When cooked, remove cloth and serve with the gravy or rich stock heated and poured over. Enough for two or three persons.

Turnip and Marrow.

One lb. grated turnip, marrow slices, 1 onion, 1 oz. dripping, seasoning, 1 small cup milk.

Mince the onion and brown in the dripping for a few minutes. Then add the grated turnip, a few slices of marrow, and the seasoning, and pour over these the cup of milk. Cook gently for three-quarters of an hour.

Baked Rhubarb Pudding.

Stew 1 bunch rhubarb in the usual way, using as little water as possible. Remove the crust from stale white bread and weigh 1 lb. Cover this with just enough milk and when quite soft squeeze out until almost dry. Mix this with 2 oz. finely-grated suet, 2 oz. sugar, and 1 beaten egg. Line a well-greased round cake tin with this mixture, reserving enough for top. Fill with rhubarb, then cover with the remaining bread mixture. Bake in a moderate oven for $1\frac{1}{2}$ hours. Turn out carefully and serve hot.

Baked Stuffing with Meat.

Boil five or six onions, add 2 cups breadcrumbs, tablespoon dripping, 1 egg, salt and pepper.

Savoury Cutlets.

One breakfast cup of mashed potatoes, 1 breakfast cup of mixed cooked vegetables, such as peas, beans or carrots, 1 cup fine stale breadcrumbs, $\frac{1}{2}$ teaspoon chopped parsley, $\frac{1}{4}$ teaspoon powdered mixed herbs, 1 egg, 3 teaspoons meat extract, salt and pepper, crisp baked brown breadcrumbs for coating, fat for frying.

Chop the mixed vegetables and stir into the mashed potatoes together with the parsley, mixed herbs, breadcrumbs, meat extract, egg, and salt and pepper to season. From the mixture form nine cutlet shapes, coat with browned crumbs and fry in hot fat for a few minutes on each side. Stand on a wire tray to drain.

Potato and Cheese Pie.

Take 3 cups mashed potato, 2 eggs, $\frac{1}{2}$ cup milk, 4 oz. grated cheese, 1 tablespoon finely chopped parsley, salt and pepper. Separate the eggs. Beat yolks and add them with the milk, cheese and parsley to the potato seasoned with salt and pepper and beat all together. Whip the whites to a stiff froth and fold into the mixture. Bake in piedish for 30 minutes in a good oven.

Little Coconut Pudding.

Cream 2 oz. butter with 2 oz. sugar, then add 1 well-beaten egg and $\frac{1}{2}$ cup milk. Stir in 3 oz. grated coconut and 3 oz. breadcrumbs, adding lastly $\frac{1}{2}$ teaspoon baking powder. Half fill a greased piedish or separate moulds and bake 30 minutes in a moderate oven. Serve with custard.

Cheeswick Pudding.

Take 2 cups flour, 1 cup sugar, 2 large tablespoons dripping or butter, 1 cup fruit (currants, raisins and peel).

Rub butter into flour, then add sugar and fruit, 1 teaspoon carb. soda dissolved in 1 cup milk. Steam for 2 hours. Serve with sweet sauce.

Brown Pudding.

Take 1 tablespoon each of butter, sugar, and jam, 2 eggs, $\frac{1}{2}$ cup milk.

Mix well together, then add 1 cup flour sifted with 1 teaspoon carb. soda. Boil for 2 hours in a mould.

Devonshire Potato Cakes.

Rub 3 oz. of good dripping into 4 oz. of flour, and then add 10 oz. of mashed boiled potatoes, 1 oz. of sugar, 1 oz. of currants or sultanas, a pinch of salt, and half a beaten egg. Mix well together, roll out about $\frac{1}{2}$ in. thick, and cut into rounds. Then either bake in a hot oven or fry in a heavy frying pan. Serve hot.

ASTRONOMICAL DATA FOR QUEENSLAND.**DECEMBER.****TIMES OF SUNRISE AND SUNSET.**

At Brisbane.			CORRECTION IN MINUTES FOR OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
1	a.m.	p.m.	Cairns	+ 50	+ 8	Longreach	+ 44	+ 26
1	4.45	6.28	Charleville	+ 20	+ 25	Quilpie	+ 33	+ 37
6	4.46	6.32	Cloncurry	+ 64	+ 36	Rockhampton	+ 19	+ 1
11	4.47	6.35	Cunnamulla	+ 28	+ 30	Roma	+ 19	+ 15
16	4.49	6.38	Dirranbandi	+ 17	+ 21	Townsville	+ 42	+ 8
21	4.51	6.41	Emerald	+ 28	+ 11	Winton	+ 51	+ 29
26	4.54	6.43	Hughenden	+ 48	+ 22	Warwick	+ 3	+ 5
31	4.56	6.46						

TIMES OF MOONRISE AND MOONSET.

At Brisbane.			CORRECTION IN MINUTES FOR SOUTHERN DISTRICTS.							
Date.	Rise.	Set.	Charleville + 27; Cunnamulla + 29; Dirranbandi + 19; Quilpie + 35; Roma + 17; Warwick + 4.							
			CORRECTIONS IN MINUTES FOR CENTRAL DISTRICT.							
Date.	Emerald.		Longreach.		Rockhampton.		Winton.			
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 12	+ 26	+ 28	+ 42	+ 2	+ 17	+ 31	+ 49		
6	+ 13	+ 26	+ 27	+ 42	+ 3	+ 17	+ 32	+ 49		
11	+ 21	+ 17	+ 37	+ 33	+ 12	+ 8	+ 43	+ 37		
16	+ 28	+ 13	+ 43	+ 26	+ 18	+ 1	+ 50	+ 29		
21	+ 25	+ 15	+ 41	+ 31	+ 16	+ 6	+ 47	+ 35		
26	+ 14	+ 23	+ 20	+ 30	+ 4	+ 14	+ 33	+ 44		
31	+ 12	+ 27	+ 28	+ 43	+ 2	+ 18	+ 31	+ 50		
			CORRECTIONS IN MINUTES FOR NORTHERN DISTRICTS.							
Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.			
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 10	+ 47	+ 38	+ 62	+ 23	+ 47	+ 10	+ 39		
3	+ 9	+ 49	+ 37	+ 63	+ 22	+ 48	+ 9	+ 40		
5	+ 14	+ 46	+ 40	+ 62	+ 25	+ 47	+ 12	+ 39		
7	+ 20	+ 39	+ 44	+ 57	+ 29	+ 42	+ 18	+ 34		
9	+ 23	+ 32	+ 46	+ 52	+ 32	+ 37	+ 21	+ 28		
11	+ 32	+ 23	+ 53	+ 46	+ 38	+ 32	+ 29	+ 21		
13	+ 40	+ 16	+ 57	+ 41	+ 42	+ 26	+ 34	+ 15		
15	+ 46	+ 9	+ 62	+ 36	+ 47	+ 23	+ 39	+ 10		
17	+ 50	+ 8	+ 64	+ 36	+ 48	+ 22	+ 42	+ 9		
19	+ 47	+ 12	+ 63	+ 38	+ 47	+ 24	+ 40	+ 12		
21	+ 41	+ 20	+ 58	+ 44	+ 43	+ 29	+ 35	+ 18		
23	+ 30	+ 30	+ 51	+ 50	+ 38	+ 35	+ 26	+ 25		
25	+ 21	+ 34	+ 44	+ 54	+ 30	+ 38	+ 18	+ 29		
27	+ 13	+ 43	+ 39	+ 50	+ 24	+ 44	+ 12	+ 36		
29	+ 9	+ 46	+ 37	+ 62	+ 22	+ 47	+ 8	+ 39		
31	+ 10	+ 49	+ 38	+ 63	+ 23	+ 48	+ 10	+ 40		

NOTE.—The plus sign (+) means later than Brisbane time.

PHASES OF THE MOON.

Last Quarter, 8th December, 12.57 a.m.; New Moon, 16th December, 12.34 a.m.;
First Quarter, 23rd December, 1.54 a.m.; Full Moon, 30th December, 12.38 a.m.

DISCUSSION.

On 22nd December the sun rises and sets about 25 degrees south of true east and true west respectively. This is the maximum angle the sun rises and sets south of east and west in Queensland.

On 23rd December the moon rises and sets almost at true east and true west respectively.

Venus.—All this month this planet will still be visible in the early evening, at the beginning of the month setting in Queensland generally soon after 9.30, about 25 degrees south of true west, in the constellation of Sagittarius and by the end of the month setting before 10 o'clock 15 degrees south of true west in the constellation of Capricornus.

Mars.—Still too close in line with the sun for observation.

Jupiter.—This planet, at the beginning of the month in the constellation of Virgo, rises soon after midnight 3 degrees north of true east. At the end of the month it rises just before midnight 2 degrees north of true east still in the constellation of Virgo.

Saturn.—At the beginning of December Saturn rises, in Queensland generally, a little before 9 o'clock 23 degrees north of true east and at the end of the month it rises near sunset. During the month then in the constellation of Gemini it will be visible practically all night.

The Southern Solstice.—Those who have been following the direction of the sun at rising and setting will have noticed that the angle south of true east and true west has been gradually increasing. During December and early January, however, it will be

It was from this apparent "standing" of the sun as it reaches its maximum angular distance south or north of the celestial equator that the phenomenon was termed "Solstice," from Sol—the sun, and sister—to stand still. The angular distance south or north of the celestial equator is known as declination. It corresponds to latitude measured on the earth's surface. On 22nd December, 1944, at 9 a.m. eastern Australian standard time (11 p.m. 21st December Greenwich time), the sun will reach its maximum declination south—23 degrees 27 minutes—and on the day of the solstice, from all places on earth, the angle south of east and west, of the sun at rising and setting, will be greatest. Again, Rockhampton, Emerald, and Longreach are at latitudes 23 degrees 23 minutes south; 23 degrees 32 minutes south and 23 degrees 27 minutes south respectively, and the sun when at this solstice, on its apparent journey from sunrise to sunset, passes very nearly overhead at these places—a vertical stick, at noon, at any of the three towns, throwing no shadow. (A reminder is given that noon does not always occur at 12 o'clock. In Queensland, noon occurs from half an hour before 12 to one hour after 12.) South of latitude 23 degrees 27 minutes, the noon-shadow is ALWAYS towards the south, but its length is shortest on this day. North of that latitude, however, the direction of the shadow at noon is towards the south when the southern latitude of the observer is of greater value than the southern declination of the sun, and towards the north when the southern latitude of the observer is less in value than the southern declination of the sun. At the southern solstice, then, for all places north of latitude 23 degrees 27 minutes south, the direction of the shadow at noon is towards the north and its length in this direction at its maximum. After 22nd December the sun appears to move north, the angle south of east and west at rising and setting, decreases; in places south of latitude 23 degrees 27 minutes south the noon-shadows lengthen; at Rockhampton, Emerald, and Longreach noon-shadows appear, and at places north of latitude 23 degrees 27 minutes south, the length of noon shadows in a northerly direction decrease, changing as the months advance from a northerly direction to a southerly direction. This changing of declination of the sun is brought about by the tilt of the earth to the plane of its revolution round the sun. With a light or some object to represent the sun placed on the surface at the centre of a table, and an apple or orange with a stick or pencil passed through the centre to represent the earth, and poles of the earth, the variation in the sun's declination may easily be illustrated. Mark one end of the stick to represent the north pole and the other end the south pole, and by a line round the middle of the orange divide the southern hemisphere from the northern. Place the orange at the edge of the table with the stick tilted from an upright direction. (The poles of the earth are tilted 23 degrees 27 minutes.) On moving the orange round the table, KEEPING THE STICK TILTED IN THE SAME DIRECTION, it will be seen that for part of the way round, the light shines over the Southern Hemisphere and, for part of the way, over the Northern Hemisphere. Another feature of the changing declination of the sun is the variation in the length of time the sun is above the horizon. Everyone knows how in summer time the sun rises earlier and sets later, and it seems the curiosity of all to know which is the shortest or longest day. To those in the Southern Hemisphere the length of the days increase as the sun appears to move south. At the southern solstice, then, when the sun is at its maximum declination south, the Southern Hemisphere will have its "longest day." The difference for a few days before and after the day of the solstice, however, is scarcely noticeable.

Supplied by the Astronomical Society of Queensland.

QUEENSLAND WEATHER IN NOVEMBER.

During the first three weeks of the closing spring month there was a marked and rapid deterioration of already adverse seasonal conditions. In the last nine days, however, substantial relief rains fell over the greater part of the south-eastern agricultural and dairying areas, and a number of central and southern inland pastoral districts were favoured with beneficial storms. Thus the month closed with the seasonal outlook vastly improved to reasonably good in most of the south-eastern divisions, but, except in very scattered areas, with the need of good general precipitation in the sub-tropical interior (especially southern border districts west from the Downs), and over the northern half of the State, very acute.

Temperature.—Except on the tropical coast, both maximum and minimum temperature means were over average, especially the day values. At Winton and Richmond, century readings (mostly 102 degrees to 109 degrees) were recorded on twenty-one days and twenty days consecutively (after the 9th) and at both places the mean maximum for this period was 104 degrees (5 degrees above normal); Thargomindah's mean maximum for the whole month (97 degrees) was also 1 degree over average. At Goondiwindi 111 degrees (the highest reported for the State) on the 19th equalled the November record for that place: it was preceded by 110 degrees on the 18th and followed by 108 degrees on 20th. Nights were unseasonably chilly in the Granite Belt.

The rain position is summarised below:—

Division.	Normal Mean.	Mean November 1944.	Departure from Normal.
	Points.	Points	PerCent.
Peninsula North	199	9	95 below
Peninsula South	220	105	52 "
Lower Carpentaria	148	49	67 "
Upper Carpentaria	153	28	82 "
North Coast, Barron	208	55	82 "
North Coast, Herbert	353	42	88 "
Central Coast, East	208	21	90 "
Central Coast, West	161	51	68 "
Central Highlands	220	133	40 "
Central Lowlands	148	33	78 "
Upper Western	105	12	90 "
Lower Western	89	10	89 "
South Coast, Port Curtis	272	112	59 "
South Coast, Moreton	357	300	16 "
Darling Downs East	277	170	39 "
Darling Downs West	232	101	56 "
Maranoa	211	81	62 "
Warrego	147	86	41 "
Far South-West	109	25	77 "

RAINFALL IN THE AGRICULTURAL DISTRICTS.

OCTOBER RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Oct.	No. of years' records.	Oct., 1944.	Oct., 1943.		Oct.	No. of years' records.	Oct., 1944.	Oct., 1943.
<i>North Coast.</i>	In.		In.	In.	<i>South Coast—contd.</i>	In.		In.	In.
Atherton	0.90	42	0.74	1.39	Gatton College	2.06	44	0.76	10.59
Cairns	2.06	61	1.97	2.59	Gayndah	2.37	72	0.58	8.42
Cardwell	1.95	71	1.42	2.81	Gympie	2.73	73	1.58	5.88
Cooktown	1.00	67	0.48	2.60	Kilkivan	2.68	62	0.58	4.76
Herberton	0.93	57	0.59	0.34	Maryborough	2.73	72	1.21	5.46
Ingham	1.80	51	1.35	1.92	Nambour	3.23	47	1.99	9.94
Innisfail	3.12	62	2.96	9.99	Nanango	2.19	61	1.03	4.63
Mossman	2.59	19	2.59	4.50	Rockhampton	1.78	72	0.63	3.32
Townsville	1.25	72	0.47	0.07	Woodford	2.53	55	2.42	7.43
<i>Central Coast.</i>					<i>Central Highlands.</i>				
Ayr	0.87	56	0.43	0.64	Clermont	1.28	72	0.06	1.70
Bowen	0.97	72	0.12	0.09	Springsure	1.62	74	0.16	3.90
Charters Towers	0.71	61	1.42	1.59	<i>Darling Downs.</i>				
Mackay	1.76	72	0.46	2.50	Dalby	2.01	73	0.79	4.62
Proserpine	1.53	40	0.50	1.37	Emu Vale	2.18	47	0.89	3.23
St. Lawrence	1.76	72	0.50	3.28	Jimbour	1.88	64	0.61	3.75
<i>South Coast.</i>					Miles	2.00	58	0.82	2.44
Biggenden	2.49	44	0.72	6.43	Stanthorpe	2.50	70	1.10	3.11
Bundaberg	2.07	60	1.28	10.23	Toowoomba	2.54	71	0.81	5.05
Brisbane Bureau	2.54	91	1.49	8.08	Warwick	2.32	78	1.23	3.05
Caboolture	2.73	67	2.75	8.06	<i>Maranoa.</i>				
Childers	2.71	48	1.21	4.97	St. George	1.29	62	0.38	0.23
Cromhurst	3.38	50	3.02	8.35	Roma	1.73	69	0.63	1.58
Esk	2.60	56	1.43	6.20					

CLIMATOLOGICAL TABLE FOR OCTOBER.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Atmospheric Pressure, Mean at 9 a.m.	SHADE TEMPERATURE.		EXTREMES OF SHADE TEMPERATURE.				RAINFALL.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
<i>Coastal.</i>	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns .. ..	..	84	68	89	28	61	3	197	11
Herberton .. ..	..	76	57	85	3	51	12	59	3
Townsville .. ..	..	83	66	91	17	58	18	47	5
Brisbane	30.12	78	59	84	28	51	19	260	6
<i>Darling Downs.</i>									
Dalby .. ..	..	81	52	91	11	36	19	79	3
Stanthorpe .. ..	..	75	42	84	22	28	19	110	5
Toowoomba .. ..	..	74	50	81	16, 22	40	19	81	5
<i>Mid-Interior.</i>									
Georgetown	29.06	94	65	101	28	55	11	47	2
Longreach	30.09	91	61	99	11	50	4	25	2
Mitchell	30.09	84	51	94	15	37	19	82	2
<i>Western.</i>									
Burketown	92	68	100	28, 29	60	4	Nil	..
Boulia	30.00	91	62	101	13	51	3	54	2
Thargomindah	30.05	87	63	102	14, 15	49	4	Nil	..

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